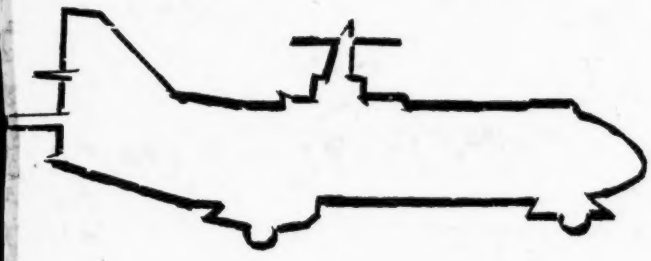

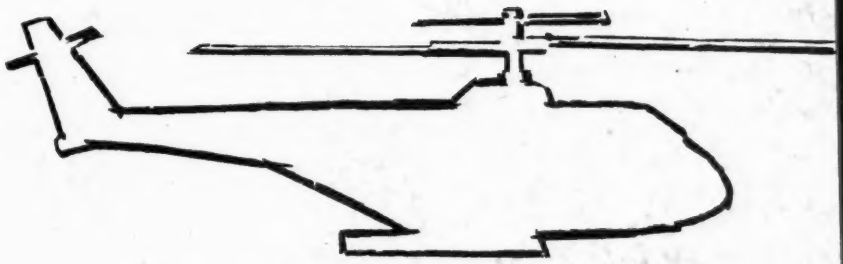

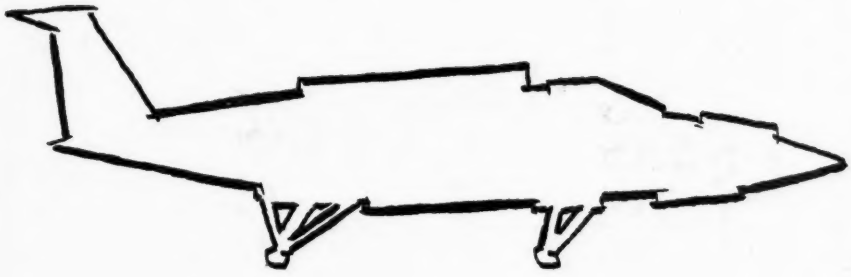

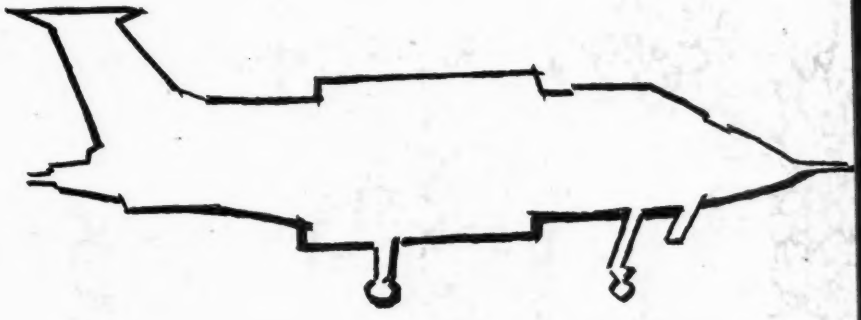

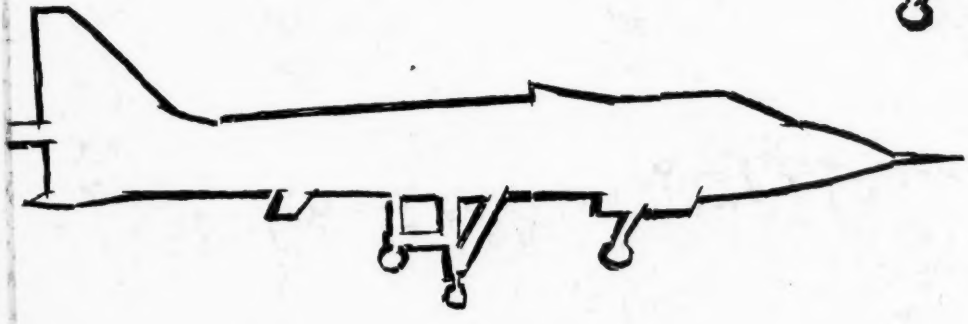

UNITED STATES ARMY AVIATION DIGEST

JANUARY 1964

UNITED STATES ARMY AVIATION DIGEST

JANUARY 1964 VOLUME 10 NUMBER 1

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CONTENTS

LETTERS 1
SUDDENLY I WAS AFRAID, Capt Carl A. Carter 2
"HORSEMEN" OF MERCY 6
THROUGH THE PACES, Maj Lambert 8
$40,000 OR 40 SECONDS, Maj Robert R. Ernst 12
PUTTING THE SQUEEZE ON, William H. Smith 14
OLD MAN WINTER, Donald S. Bird 15
FROST AND FLIGHT, Richard K. Tierney 16
HUMAN FACTORS IN COLD WEATHER OPERATION, Wallace W. Prophet and Russel E. Schultz 20
IMPRESSIVE BUILDUP CONTINUES AT RUCKER 24
LIGHT AIRCRAFT ICING 26
COLD INJURIES 27
THE RIGHT WAY 30
EMERGENCY SITUATIONS, Capt Donald M. Hopwood 31
YOUR WEATHER SERVICE, Lt Col C. M. Hill 36
CRASH SENSE 37

The mission of the U. S. ARMY AVIATION DIGEST is to provide information of an operational or functional nature concerning safety and aircraft accident prevention, training, maintenance, operations, research and development, aviation medicine, and other related data.

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Articles, photos, and items of interest on Army Aviation are invited. *Direct communication is authorized to: Editor-in-Chief, U. S. Army Aviation Digest, Fort Rucker, Alabama.*

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LETTERS

Sir:

The challenge issued . . . to disprove that the Fort Bragg aircraft maintenance crew's "Big Sister Act" was the first of its sort, evacuating an UH-1B with another helicopter, was met by a "Big Mother Act" during Howze Board activities. On 26 Jul 62 in a demonstration for the Secretary of Defense during a two rifle company combined artillery and Army air supported attack of a fortified position, an UH-1B lost its tail rotor in the center of the demonstration impact area while flaring prior to landing in a dense smoke cloud. In order to continue this demonstration as planned, the bird had to be moved. To do this a CH-37 with a prepared maintenance crew flew immediately to the injured bird. This maintenance team accomplished their task so coolly in just five minutes that the spectators thought the recovery of the downed aircraft, rotor and all, was part of the show.

1/LT CURTIS J. HERRICK, JR.
1st Airborne Battle Group
Fort Bragg, N. C.

Thanks, but we were seeking other examples of a "big sister act," one helicopter lifting another of its own kind.

Sir:

In the July, 1963, issue of the publication "U. S. Army Aviation Digest," pages 16-18, appears an article. . . .

This article refers to Nickel-Cadmium storage batteries manufactured by Sonotone Corporation and used in Army aircraft. Accordingly, the words "nickel-cadmium" have been reduced in a seemingly purposeful manner to the generic term "nicad."

You are hereby advised that the word "NICAD" is a registered trademark for storage batteries and electric lamps powered by storage batteries and is owned by Gould-National Batteries, Inc., the forerunner in U. S. production of all types of nickel-cadmium storage batteries.

* * *

The public has come to know our nickel-cadmium batteries as "NICAD" and use by anyone in reference to any nickel-cadmium batteries from any source other than Gould-National Batteries, Inc., is misleading and confusing to the public and constitutes infringement of our trademark rights. . . .

GOULD-NATIONAL BATTERIES, INC.
St. Paul, 1, Minn.

Sir:

I thought that you may be interested in knowing that your articles regarding the wearing of protective clothing while flying are wasted effort and should be discontinued. Being denied the opportunity to wear the flight suit, I am not at all interested in how safe I COULD have been. Rather, I would suggest that you devote the otherwise wasted effort determining the feasibility of the APH-5, as surely that's next to go.

Just how can anyone authorize this indifference to what should be respected Army opinion? After all, hasn't it been proven that the flight suit, as well as the APH-5, is designed to lessen the possibilities of serious injuries (i.e. burns) in the event of the unexpected? Hasn't it been established beyond doubt that you're less likely to suffer these severe burns if you're wearing a flight suit than if you weren't? How much money and time have we spent coming to these conclusions just to have someone publish a directive prohibiting the wearing of the flight suit EVEN WHILE FLYING! Incredible as that may sound, it's happened. And what is worse is that it's happened here in Vietnam! Not in the States where for reasons of their own some local commanders choose to discriminate against aviators, but here in Vietnam where getting shot at is routine and forced landings are as common as rainshowers. Where is the logic?

One wonders at the reasoning behind such an unthinkable injustice. Could it be that all-too-familiar line: ". . . for the sake of uniformity"? Or perhaps we're here to impress someone with our appearance. Not that the flight suit looks all that bad but starched fatigues and spitshined boots do look sharp . . . at a Saturday morning inspection. However, the fact remains that this is not a Saturday morning inspection; it is instead a war, "a dirty little war." Already subject to being injured or killed, there are those who have compounded this vulnerability by abolishing the flight suit . . . why?

LT HOWARD K. RUDEEN
APO 96, U. S. Forces

Sir:

As one of the "non-rated commanders" Captain Dennison was referring to in his November article "Proficiency Loss," I would like to carry his arguments to their clear, cold, conclusion, most especially because it was made a monthly winner of your Annual

Continued on page 13

Mushing along at 90 knots with METO power, airspeed falling off rapidly and . . .

Suddenly M

IT ALL BEGAN on a brisk January morning as we taxied our DC-3 "Gooney Bird" out for takeoff at Muscle Shoals. So far it had been a routine flight between Augusta and Memphis.

We left Augusta earlier that morning in clear weather with the temperature in the thirties. Clouds had begun forming as we neared Huntsville and it wasn't long before we were on instruments. Memphis center changed us over to Huntsville approach control and we were cleared on in. Upon reaching minimum altitude we were VFR and a contact approach was all that was needed.

While we were at Huntsville an overcast had moved in, but as we continued our flight to Muscle Shoals we were able to stay low and remain VFR. Now, we sat at the edge of the active at Muscle Shoals waiting for our clearance and anticipating no trouble.

Finally Muscle Shoals radio came on the air and I began copying the clearance as the pilot completed the engine runup:

> You are cleared to the Rossville intersection via V-54 to maintain 4,000 feet; center advises unable to approve 8,000.

The pilot and I looked at each other. "4,000!", he exclaimed, "that will put us right in the soup."

We both knew that we would be going through a front and there was a chance of light icing. No one had reported any ice, so we agreed to go ahead and try 4,000.

The takeoff and climbout were normal. After intercepting V-54, the old Gooney Bird was leveled off at 4,000 feet. The hostess came up with the always welcome cup of coffee and smile. She reported that her 18 passengers were doing fine, and one gentleman wanted to know what the weather was in Memphis and if we expected to get in on time. With all the confidence in the world I replied, "We're always on time. I'll check on the weather and let you know."

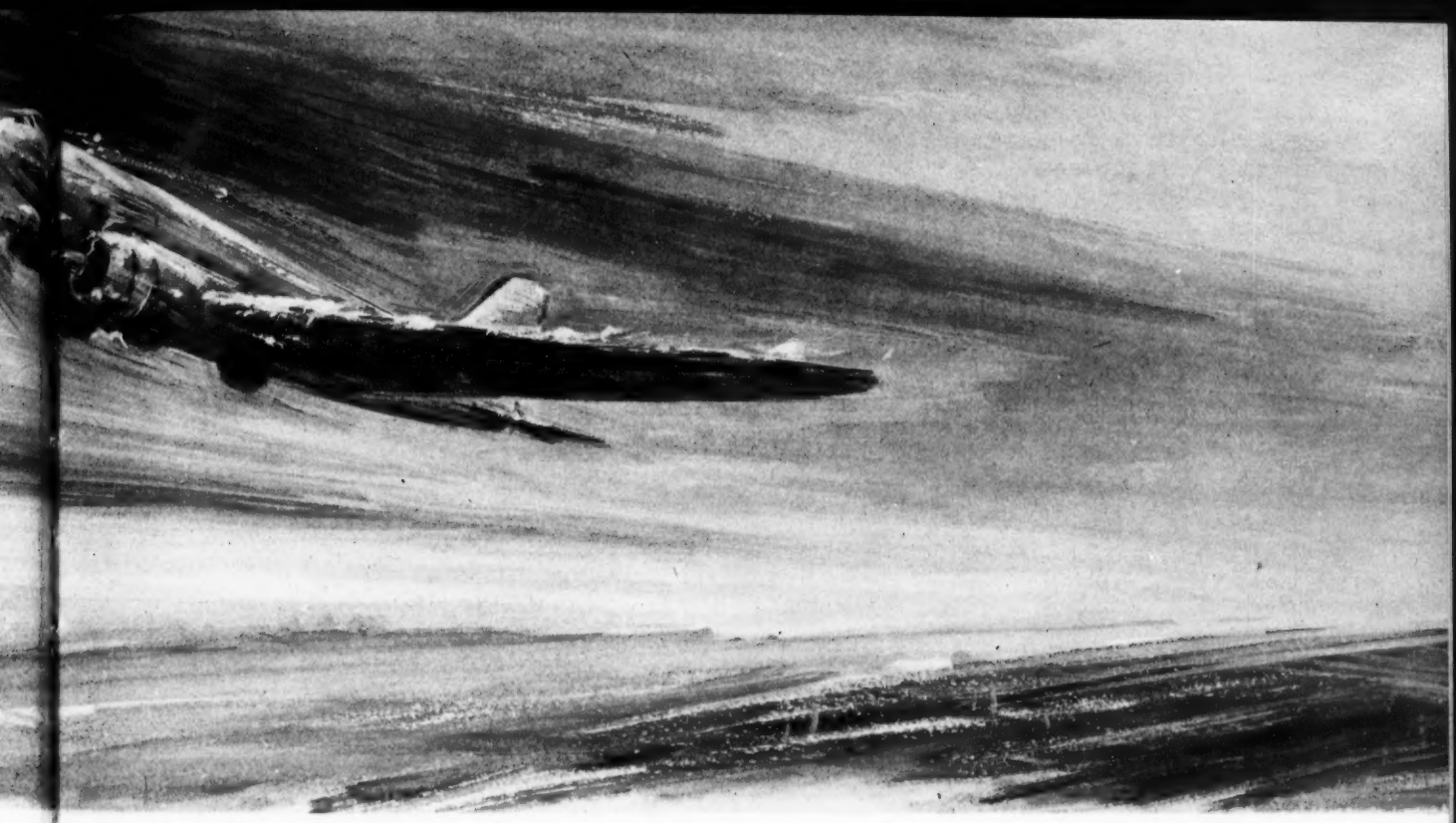
Between sips of coffee and adjustments on the carburetor heat to keep it in the green, I called Muscle Shoals radio for the latest Memphis weather, which had not come off the teletype before takeoff. The weather in Memphis was 800 overcast and 6 miles visibility, temperature 32° F, with very light rain. On the other radio a DC-7 reported light icing during climbout from Memphis.

One thing was certain: the outside air temperature was just below freezing. We would pick up some ice. I noticed a very narrow strip of what looked like frost forming on the leading edge of the wing. However, we felt there was nothing to worry about because a DC-3 behind us was reporting in the clear at 7,000.

By this time we had completed about one-third of this leg of the flight. The pilot asked me to check the remaining fuel and the weather at our alternate. As was necessary many times because of loads, we had left Muscle Shoals with the minimum amount of fuel to reach our alternate, Jackson, Tenn., and still have the required reserve.

The pilot called Memphis cen-

A former airline pilot, Capt Carter is assigned to the Dept of Maintenance, USAAVNS, Ft Rucker, Ala., as an OFWAC instructor.



I Was Afraid!

Captain Carl V. Carter

ter and asked for a higher altitude. We were advised to stand by. As we waited, ice began accumulating on the windshield. Each propeller was getting alcohol now at the rate of 3 quarts per hour. We could hear the ice hitting the side of the fuselage when the rpm was moved back and forth from 2050 to 2350.

Memphis was still 30 minutes away. We were just about halfway when Memphis center informed us that we could expect a higher altitude in 10 minutes. The pilot reported that we were in moderate icing and needed a higher altitude as soon as possible.

We had been cruising at 130 knots. Now the airspeed was registering 115 knots. The attitude indicator was showing a slight nose-high attitude, which we needed to maintain 4,000 feet. The deicer boots were put into operation and some of the ice was falling off the wings—but not as well as I had expected. Now my side window was beginning to freeze over. I tried the windshield wipers, and found they were stuck in the down position. I applied more alcohol to the windshield, but this did not free them. I knew that I could reach the wiper on my side from the side window, but it would not slide to the rear. We had just lost our windshield wipers.

Both of us had flown in ice many times before, and knew that we could probably climb and get into warmer air. Memphis center finally cleared us to 5,000. We applied METO power and proceeded to climb, but noticed that our airspeed quickly dropped to about 80 knots and that we were climbing very slowly. We finally nursed the old bird to 5,000 feet. We reduced power to 35 inches and 2350 rpm, but could hold only 90 knots. We both were working full time now to keep the Gooney Bird flying.

I had taken charge of the flight controls, and the pilot was exercising the engine controls. Each time the rpm was increased ice would break loose. It sounded as if it would tear holes in the side of the aircraft. I found out later

that the stewardess had noticed the windows in the rear freezing up and started to the cockpit to find out what was happening. She got as far as the cockpit door when she heard the ice hitting and realized that we didn't have time to talk to her. She returned to her seat and sat down. Later, after talking to her I learned that she had said a little prayer. I realized that I probably would have too if I had had time.

The pilot asked me to take a look at my wing. I tried but I couldn't even see the engine nacelle. He tried his, and I don't think he saw very much either. We knew now that we were icing up at a steady rate, and our deicing boots would not keep the wings clear. Climbing to another altitude to get into clear or warmer air was no longer possible. Holding 5,000 feet was all we could do. The ceiling was too low to break out at a safe altitude if we descended.

Memphis center came on the air, "You are now cleared to 7,000."

The pilot answered, "Unable to climb; airspeed now 85 knots with METO power."

Memphis replied, "Roger, maintain 5,000 and contact Memphis approach control."

Approach control responded quickly:

> Depart Rossville heading 340° for radar vector to back course ILS approach course, landing straight in runway 27; ceiling 600 feet, visibility 5 miles, light rain; descend at pilot's discretion.

I breathed a sigh of relief. Almost straight into runway 27 would be a lot of help. We were already too slow for comfort. An engine failure now would mean certain trouble. We would have to descend and flight would be impossible on one engine.

Our fuel consumption had almost doubled due to the power necessary to maintain altitude. We would not run out of fuel, but if the FAA inspectors were waiting in Memphis with the dipstick, our day would have been spoiled.

The omni needle was beginning to show Rossville. As we approached 4,000, the vertical speed indicator showed 500 fpm descent and 90 knots airspeed. *We would be able to make it,* I told myself. I called for an immediate approach clearance over Rossville intersection. Our altitude now was 3,500 feet and we were still descending with climb power.

We were lucky because we knew the approach from memory. Had we been at a strange airport, I doubt that we could have taken time to look at an approach chart.

Then a horrible thought hit me. How would we be able to see the runway after breaking out of the overcast? The windows were completely frozen over and we couldn't see a thing. We put all the alcohol we could on the windshield. Then I

thought of a trick I learned from another pilot. I picked up the spot lamp we had aboard and held it against the windshield. My feet were freezing and my forehead was wet with perspiration as I watched anxiously for the ice to break off the windshield. Suddenly I was afraid.

We were on the approach course now. Oakville intersection would be the next checkpoint and the final station inbound. I thought I noticed the ice loosening on the windshield next to the spot lamp. If the windshield cleared and both engines continued to run, we could make the field. Other than vibrations caused by ice on the propellers, the Pratt & Whitneys seemed to be enjoying the flight much more than we.

We approached Oakville intersection, unable to maintain altitude. We were down to 1,300 feet on the altimeter and needed to hold this altitude until reaching Oakville. Ninety knots was all the airspeed we could possibly get and this was with METO power. At 1,000 feet we started to break out, and a feeling of gratification surged through me as ice began tearing loose from the front windshield. The omni showed Oakville. Straight ahead we could see the runway.

With our engines at METO power and 90 knots airspeed we continued toward runway 27. I could have sworn someone was throwing bricks at us as ice came off the propellers and hit the fuselage.

My side window was frozen solid so I did not know how much ice was on the wings. I could only see straight ahead. Our stall speed had to be greatly increased with the load of the ice on the wings. We had to keep all of our power on and airspeed up. We succeeded, and until this day I don't understand how we could fly at 90 knots without stalling out. We touched down with power on and came to a stop about 4,000 feet down the runway. I was happy to be on the ground.

After pulling up to the ramp and parking, I helped open the door to get out. I had to kick rather hard to break the ice. The first place I went to was the wing of the aircraft. I was glad that my side window had been frozen over. If someone had asked me whether an airplane would fly with as much ice as we had, I would have laughed at him.

When I think back over the flight I realize that it all could have been avoided. We were flying in unsafe conditions and we were in these conditions because of *our* foolishness.

To begin with we knew there was a chance of some icing en route. The first mistake we made was filing into weather without a good briefing from a weather forecaster. The only weather we had seen was on teletype sequence reports. We had asked for an altitude that would have put us on top of the overcast. We should never have taken the lower altitude because we knew we could expect ice.

Once we started picking up ice we were content to let our airspeed drop off without ever adding power. This meant we had to fly the aircraft at an increased angle of attack. As a result we exposed more of the surface of the wing to the relative wind and picked up more ice. Once we started losing airspeed we should have come in with more power to maintain as high an airspeed as possible. When we made the slow climb to 5,000 feet from 4,000 feet, we lost fuel and time because the angle of attack was further increased and airspeed lost.

If you should find yourself in ice, the time to get out is then, not later. Do not wait around and get heavy with ice and expect to climb out of it. If you have equipment such as windshield wipers, keep it working. Keep your airspeed up and remember that an increase in power calls for an increase in fuel consumption.

Probably the greatest lesson to be learned from an experience such as this is that an ounce of prevention is worth *many* pounds of ice.

"HORSEMEN" of MERC

Choctaws cross paths over Vaiont dam area. Landslide occurred in area to extreme right.

Early on a Thursday morning in mid-October, SETAF responded to a request for aid from Italian officials in the Belluno area. There a tidal wave, caused by the side of a mountain falling into the lake behind the towering Vaiont dam, had flooded the village of Longarone and was sweeping south, creating havoc in its wake. Reports indicated that Longarone, with a population of 4,500, was almost completely under water. The Vaiont dam, tallest in the world, was damaged at the top. SETAF helicopters with medical equipment were rushed to the scene.

THE ROLE OF the U. S. Army's Southern European Task Force (SETAF) 110th Aviation Company during the recent disaster in Belluno province of northern Italy has been acknowledged by the U. S. Congress and made a part of the Congressional Record of October 28, 1963.

The Honorable Silvio O. Conte, congressman from Massachusetts, took note of SETAF's participation in the rescue operations in the Longarone area. In part, Mr. Conte said: "Mr.

Speaker, judging from the press coverage of the recent tragedy in the Belluno area of Italy, I wonder if most Americans as well as my colleagues are aware of the outstanding work done by SETAF's 110th Aviation Company.

"Having been fortunate to read recent Italian press coverage of this most terrible occurrence, I was amazed at the extent of their involvement. Their use of the 6-ton CH-34 Sikorsky trucks of the sky in Longarone was essential, and, all told, they transported 180 tons of cargo, laid communications wire by air, carried out more than 300 different missions, carried 4,351 passengers, and flew a total of 142 hours, or 11,360 nautical miles. . . ."

* * *

A cafe owner in the village north of the disaster said: "It was a terrible thing to awake in the morning and see the effects of this great disaster. After the shock had worn off so that we could start to think, we attempted to probe through the wreckage, looking for anyone we could find alive.

"Suddenly we all looked to the sky and we could see four flying birds approaching. From that distance it looked as if the mythical 'Four Horsemen of the Apocalypse' were descending.

"Gradually these four birds descended, and then we realized that they were helicopters of the U. S. Army, actually 'Four Horsemen of Mercy.' "

Dubbed "The Four Horsemen" by the townspeople in the disaster area, these Southern European Task Force (SETAF) helicopters from the 110th Aviation Company in Verona assisted in locating the dead and injured at the disaster area in Longarone and nearby towns.

Initially the SETAF helicopters evacuated about 20 persons from the disaster area behind the dam. During the entire rescue mission the helicopters relocated more than 1,000 persons, mainly evacuees from isolated hilltop and river villages.

One entire village was evacuated by the helicopters. The mountainside village of Casso was in danger of disappearing into the valley below. It was a common sight to see the aircraft picking townspeople from one side of the mountain and then shuttling to the other side where many more were waiting.

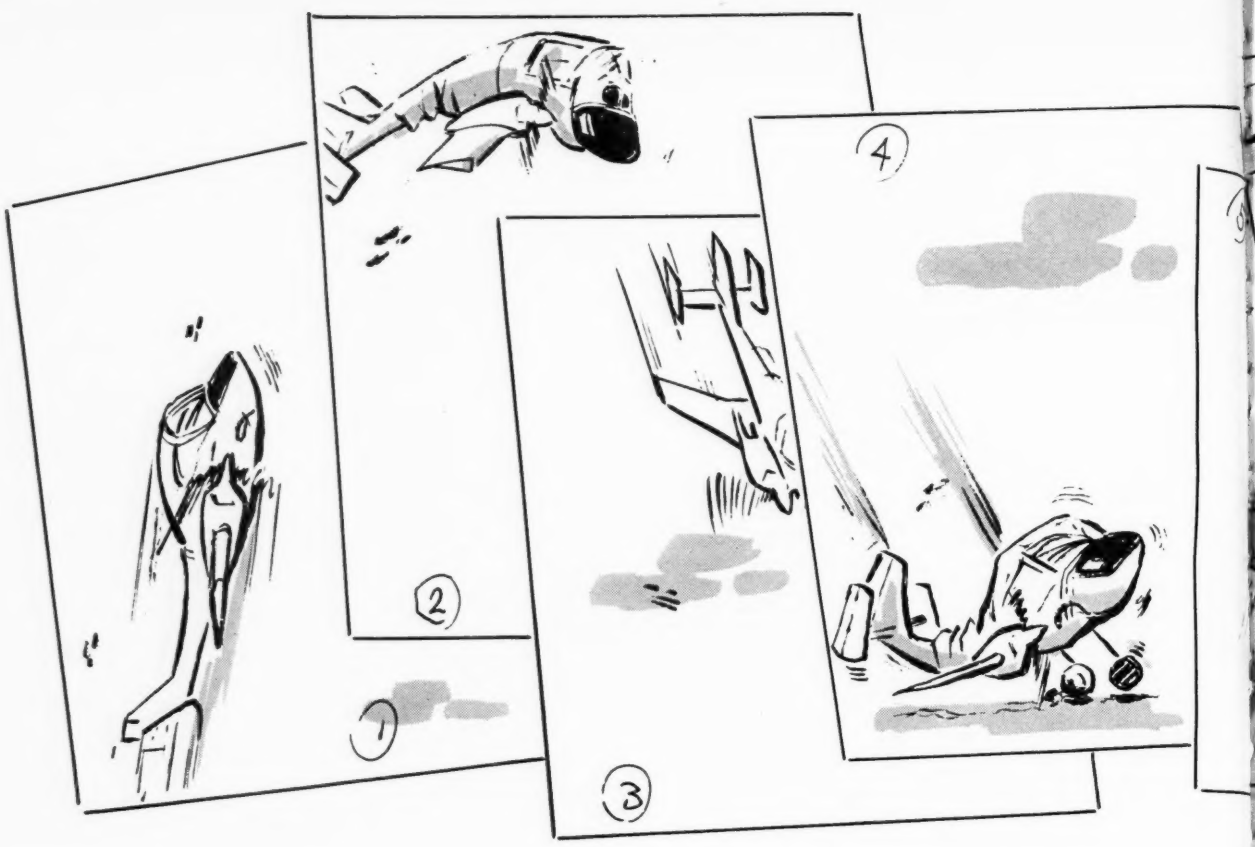
One woman almost gave birth to her baby in a SETAF helicopter. When the pilot landed the craft, she was turned over to Italian medical authorities. Her baby was born a short time later.

An average of five CH-34 Choctaw helicopters were used daily in support of operation. With only 37 men on hand the helicopter crews and maintenance personnel faced a gigantic task. Sixteen pilots, twelve crewchiefs, and nine ground personnel performed an unbelievable work schedule.

In many cases the maintenance men worked around the clock to keep the helicopters in peak condition. Ground personnel consisted of one equipment specialist, two petroleum-oil and lubricants personnel, three maintenance men, and one maintenance noncommissioned officer.

Taking victims from the disaster site at Longarone

An injured woman is lifted from a CH-34 after evacuation from the disaster area



Through the P

mbert

Performance figures and flight techniques in this article are not intended to supercede those found in TM 55-1510-204-10.

—Editor

This article has been adapted from FLIGHT International magazine, London, England.

AEROPLANES are definitely becoming more interesting to fly, especially when they pack the powerful punch of lightweight turboprops. The Grumman Mohawk (OV-1) is probably the most unusual of these intriguing aircraft. It surpasses in performance anything the U. S. Army has in the front line.

During a demonstration of the Mohawk by Ralph Donnell (senior Mohawk test pilot), I saw him rolling into a feathered propeller at low level, cruising past

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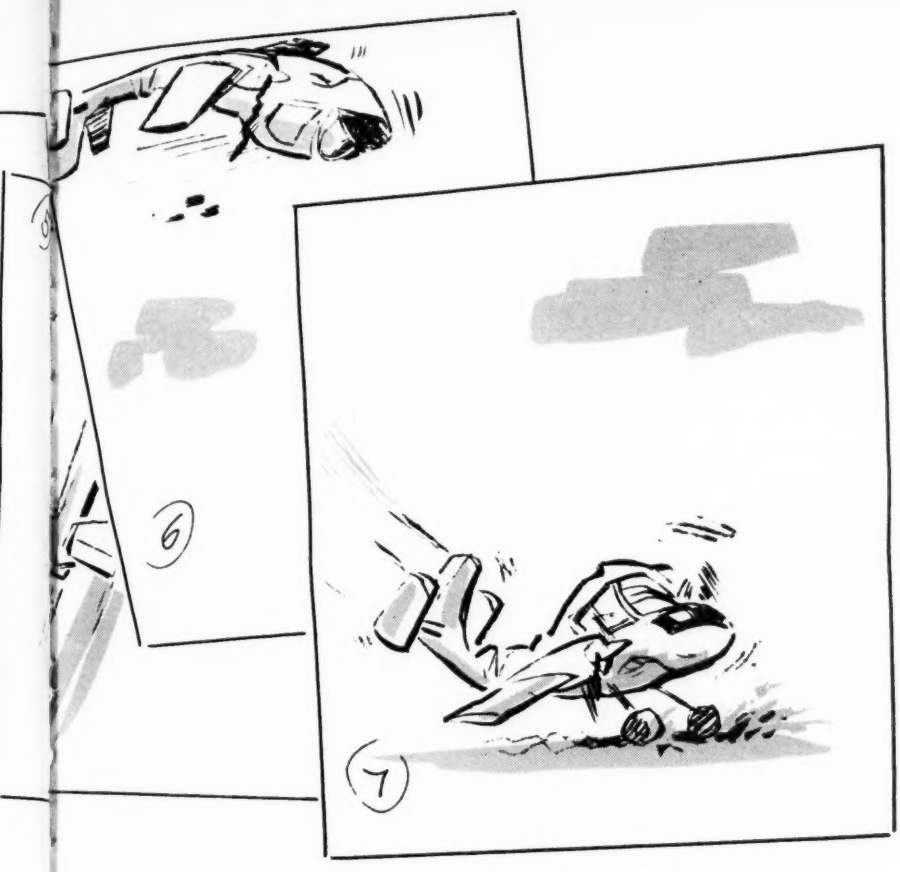
Mr. Lambert is on the editorial staff of FLIGHT, specializing in evaluation flying of all types of aircraft. He has flown approximately 140 types of aircraft.



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mbert

at about 60 knots looking down at the spectators 30 feet below and topping some long zoom climbs with vertical rolls which clearly showed complete confidence in low-speed handling.

In some pretty impressive maneuvers, I learned just how confidence-inspiring the Mohawk really is. I flew with Ralph when the Mohawk had full internal fuel and weighed about 12,500 lb with all its 1AF-type equipment. Ralph taxied out using nosewheel steering and turned about one wingtip. He then switched the steering off and turned about one wheel with brakes alone. The steering is limited (relatively) to avoid screwing a wheel into soft ground by pivoting on it.

Simple cockpit checks included 5° right aileron trim to counteract torque. In the controls I found the typical clunking, springy feel of spring-tab ailerons and a distinct centering feel on the elevators, which also seemed to have some inertia. With clearance from the tower, Ralph lined up and handed straight over to me. I opened the throttle progressively and we began to tear off down the runway. Briefly I noticed that the nosewheel steering was extremely pleasant before we reached 60 knots and I began to feel for solid air on the controls. I inched the stick back until we rotated into the air at 80 knots without any real feel and settled, as instructed, to climb at 100 knots. When Ralph moved the levers, the gear came in with a hefty thumping and the flaps retracted, but only slight trim changes resulted.

Reduced to military power we rocketed upwards at 2,000 ft/min, with lots of runway still somewhere under our backs. I noted the rate of climb and Ralph applied full power to send us uphill at least half as fast again.

The Stuttgart runway was still beneath us at 2,000 feet. To prove his first point, Ralph said it would be dangerous, wouldn't it, to pull the stick hard back in this steep climb—and then he did so, vigorously. The Mohawk just sat right up and begged—and shuddered, but did not give. There was plenty of vibration, but no real stall developed and we kept going uphill. Normal takeoff technique is in fact to hold the stick hard back all the time. When the wheels clear the ground, the tail holds up for a

while until it leaves ground effect and the nose comes right up. Pressure is released only at that point.

We leveled off at about 5,000 feet and 120 knots and I found control forces fairly heavy, but response very good. Ralph now had something to show me. We normally consider an airplane first as a glider, don't we? Alrighty. He armed autofeather, reduced power to less than 10 lb/sq inch torque and slammed the throttles into full power and back, one after the other. Immediately both propellers feathered, but the gas producers continued to idle. So we glided down at 120 knots and 1,100 ft/min.

We could have pressed the unfeather buttons and been under power in seconds but Ralph said, "We now want to apply more drag, don't we?" The speedbrakes were opened with small drag at this speed and a little vibration. Rate of descent increased. Next drag stage was to unfeather the propellers and put them into fine pitch for discing drag: rate of descent 3,000 ft/min. Gear and then full flap were extended and we then stood on the rudder pedals as we plunged earthwards at almost 5,000 ft/min, still at 120 knots.

The remarkable thing is that no one had touched the stick since we first feathered the propellers. The elevator trim was at 1° noseheavy. Then, from ground idle, the throttles were slammed open to full power, and in what seemed like less than 12 seconds we had full power and the nose reared up into the climb attitude. Still no one touched stick or trim-wheel and the speed remained at 120 knots!

I next cleaned the Mohawk up and cruised at moderate power, making 120 knots. I could turn with either aileron or rudder alone and the controls were extremely good, if one makes allowance for the distinctive elastic feel of spring-tab ailerons. I noticed that elevator response was slow, so that I could rock the stick and produce a soft rhythmic bouncing up and down, without significant pitch-attitude change. For a while the slow pitch response gave the impression of instability, but stick rate was positive and pitch response was progressive. The delay was really encouraging slight overcontrol. This all somehow rang a bell in my memory and I later realized that the Mohawk is remarkably like a Meteor to handle, although it has a much better rate of roll.

At 120 knots, which is well below the normal operational speed of 180 to 200 knots, a stall buffet appeared at 1.5 g in a turn. In level flight I reduced speed progressively and strong buffeting set in until we lost lift with the nose well up and stick hard back at 80 knots. There was a little aileron in hand and plenty of rudder. Neither wing nor nose dropped—a completely innocuous stall with an unusually strong and early warning. Try as I might, I could not get the Mohawk to stall more firmly.

Speeding up to 190 knots, I found powerful control and excellent, fighter-like maneuverability. It was most noticeable that speed had a considerable effect on directional trim, and rudder correction was required very much in the same way as in a Spitfire. Ralph dived to 250 knots and extended the airbrakes. They pulled us back hard and caused a slight nose-up trim change.

Diving speed is 390 knots and minimum speed, clean, 80 knots. This is already a respectable speed range, but extension of flap brings an astonishing change in the Mohawk. Maximum flap speed is 153 knots and application of 15° brings the slats out and cuts in the fully powered inboard ailerons, which droop at 25° with the stick central. Their main purpose is to assist single-engined control by reducing the lift of the wing being blown by the "good" engine, but they also provide remarkable rolling power. Trim changes with flap are small and easily cancelled out with the large trim-wheel.

At 80 knots, when I had previously stalled and had very little aileron left, the Mohawk now exhibited fighter-like lateral maneuverability and no sign of a stall. At the best turning speed of 85 knots the radius of turn is a mere 355 feet. The aircraft can be thrown around or, for operational purposes, threaded through narrow gaps in obstructed approaches. I pulled back until liberal shudder on wing and rudders announced the stall at 64 knots. But the nose would not drop and I had powerful aileron and rudder control. Full back stick just would not produce a proper break into the stall, even if I released pressure momentarily and rocked the Mohawk back onto its tail. With full flap the behavior was just the same, but the minimum speed with power was back to 60 knots. Stall warning was very powerful, but behavior could not have been more innocuous. The elevators still responded slowly and were in fact the weakest control at speeds just above the stall.

Finally we tried single-engine control. Ralph feathered one engine with the Mohawk flying clean at 120 knots. I could not tell for some seconds which one had stopped. Trim changes were mostly lateral and a specially big aileron trim-wheel was fitted because of this. Vmc with flap is 72 knots, and without, 88 knots. Best rate of climb speed with

flaps is 80-85 knots, and without, 135 knots. Best angle of climb speed with flaps is 75-80 knots. I accordingly set up a full-power climb with 15° flap and gear up at 75 knots and 6,000 fpm, quite high for single-engined performance. Ralph reduced power on one engine and then feathered it. A big heave of rudder and aileron held me straight and I put the nose slightly down to gain 80 knots. The Mohawk began to shudder and lose height and I applied full aileron and rudder trim with about half travel applied on both surfaces. The shudder smoothed out and we began to climb healthily, but I complained to Ralph that the rudder load was too high.

"Alrighty, apply full rudder," he said. When I did this I noticed that pedal load decreased almost to zero, the antibalance tab having fined off to neutral. Then he suggested that I try climbing with my feet off the rudder. So I let go, and found that I could climb straight with almost full aileron and no rudder. In fact the Mohawk climbed better with the rudder free and full power on one engine. That is why Grumman was not greatly worried about the high rudder load at the halfway point! I could hold the necessary aileron with one fingertip. This is really an extraordinary airplane. Note that we were then climbing on one engine at about the clean stalling speed, but 15° flap and slats gave full flying capability.

By now we were some way east of Stuttgart and Ralph coupled the autopilot to the appropriate VOR radial. The Mohawk then took itself home with height lock applied, while we rested, adjusted ventilators and fiddled with the height adjustment of the ejection seats. I found that the cockpit was extremely comfortable and visibility excellent. There were two rear-view mirrors for each occupant and sunblinds overhead to keep off the blazing sun.

Finally we neared Stuttgart and Ralph told me that I would learn more about landing the Mohawk by watching him than by doing it myself. With gear and flap down and zero torque we descended at 3,000 ft/min towards a rough grass area near the U. S. Army dispersal. Final approach was made at 80 knots with torques varying between 12 and 20 lb/sq in and an average rate of descent of 500 ft/min. At a theoretical 50-foot barrier, Ralph jabbed the stick forward and the Mohawk slowly nosed-over towards the ground. Then Ralph pulled the stick all the way back and it seemed that we would hit the ground really hard. Just when I was waiting for the heaviest of all landings, the mainwheels touched the ground and the oleos just mopped up the impact without the slightest jerk. Instantly we were in full reverse thrust and pressed hard towards the windscreen as the 12,000-lb aircraft pulled up in under 100 yards.

It was a staggering performance and the German controller in the tower immediately called and said, "You must have a very good undercarriage, Mohawk." Ralph replied that it was a good thing to have, wasn't it. Personally I think the Mohawk *is* a good thing to have.

The final demonstration, while I was still sweating from the landing, was to back into our parking slot and then, having applied the brakes, to rock the aircraft gently back onto its tail bumper with reverse thrust. Reason? To test full reverse thrust or change a nosewheel without jacks.

Oh well, it sits up and begs and is as docile as an old four-legged friend. You cannot get on the wrong side of the Mohawk's aerodynamics; but watch out for that reconnaissance capability!

$40,000 or 40 Seconds

UH-1 Hot Starts

Major Robert R. Tyner

DURING OCTOBER eight UH-1 hot starts were experienced by the training fleet at Fort Rucker. A T53 engine costs more than $40,000; it takes a maximum of 40 seconds to start one correctly! Repair of a damaged T53 also is a costly operation.

What is the hot start record in your unit?

UH-1 starting procedures in the −10s are accurate and should be followed. Other factors, however, affect a start and should be remembered by the aviator. Consideration of these factors is now emphasized at USAAVNS.

Before making a start, stop a moment to think. What gauges are you going to watch, in what order? and what are you going to do if the EGT (Exhaust Gas Temperature) goes above 600° C? What if the emergency governor manipulation does no good? A few seconds thought may save some last minute fumbling—and an engine. It is especially important that IPs drill and redrill students on this.

Before pulling the starter trigger make one more mental check. Have you really got the throttle in the starting detent and have you beeped the governor to full low?

Do not try to make a start with a 15-knot (or higher) wind blowing up the tail pipe, and don't forget that another helicopter running up or hovering behind you can cause such winds.

A battery with less than 24 volts indicated with only the battery switch in the ON position is not likely to give you a start and most likely will result in high EGT and abort. Some batteries showing 25 volts or more still will not give you a start. Sick battery condition can be discovered by watching the voltmeter when the start trigger is pulled. Ordinarily, voltage will drop to about 5 volts immediately, then move back up to about 13-15 volts in 5 seconds or less. If it

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does not, shut off the throttle, pull the ignition circuit breaker, and continue to motor the engine until you are sure there is no fire in the burner.

When a battery start must be made, leave your inverters OFF until you have a fire going and all indicators show no trouble. Then switch inverters ON and check engine and transmission oil pressure. These oil systems are not likely to fail in the first place but if they do, you still can shut down before causing damage. Not using the inverters during starting can save you considerable amperage.

If you have a doubtful battery and no heavy duty APU, you should not try a start under ordinary circumstances. If special circumstances exist and you must go, at least two aids can increase starting amperage:

1. Parallel wire other batteries of any voltage up to 28 volts and plug this assembly into the external power receptacle, then try your start with battery switch ON.

2. Plug any lightweight low amperage APU into the external power receptacle and turn the battery switch ON. Every 5 minutes disconnect the APU and check battery voltage rise. When and if voltage comes up to 24 volts or more, go ahead with your start. Leave the APU disconnected, because you may damage it as a result of overload.

Ordinarily enough APUs are at an airfield to prevent serious loss of time waiting for one for the first start of the day (which generally is the most critical one). Unless unusual circumstances exist or large loss of time is expected, prudence would indicate use of an APU.

Whenever feasible, cross-country stops should be planned only for places where APUs are available. Generally APUs can be found at any military installation. Airfields with commercial airline personnel will usually lend you their APU and an operator at no charge.

Continued from page 1

Award contest. Presumably this means his thoughts echo the feelings of rated readers.

First let me restate his case in unequivocal language:

Loss of flying proficiency causes accidents, reduced flying motivation, and reduced ability in short field work and in higher performance aircraft.

Ground duty is demanding and prevents pilots from maintaining proficiency.

Rated supervisors cannot demand more proficiency flying because they are trapped by an administrative workload which their pilot subordinates must help shoulder.

Solution:

Eliminate extended ground duty tours.

Force ground commanders into letting pilots maintain proficiency during duty hours.

Force ground commanders into releasing their pilots for one week's aviation duty every six months.

Force aviation commanders into making instrument equipment available to all pilots.

Put flying experience as a high priority for assignment of Cat II pilots.

Substitute flying for physical training.

Captain Dennison's argument springs from an unspoken but loudly implied premise which must be recognized without fuzziness or sugar-coating: flying is a demanding full-time job, and the better the pilot and his usefulness to Army Aviation the more he must be permitted to work at it. Now I want to state its corollary: ground duty, especially for the young rated officer in a combat unit, is also a full-time job, in which his contribution, and his gaining proficiency, are directly proportional to how hard and long he works at it, and how much his heart is in it.

Therein lies the dilemma Army Aviators had better recognize and think hard about, for both the demands of the ground and the demands of the air are getting greater. I resist the imputation that the solution lies with ignoring the demands of the ground while solving the problem of the air, for that leads to just one end: pilots who are "not proficient" in increasingly responsible ground assignments. The price of poor flying proficiency is often dramatic —a crash. But the price of poor desk jockeying can be just as serious, especially when that desk man is a staff officer making policy when he never quite mastered the professional jobs of the subordinate officers or units he is directing.

I do not want to degrade the problem Captain Dennison addresses. It is a frustrating, career-long problem and causes many a good officer-pilot to think deeply about his own abilities and future, both in the air and out. But I must point out that the Captain's solutions are merely lopsided subversions of present policies which were originally intended to maintain good pilots while making good ground officers. In short, the article you commend only attacks half the problem because it does not admit the other half is of equal concern to the Army.

The heart of the matter is the validity of the basic Army premise: that an average rated officer can be both a good pilot and good ground officer throughout a career. Having served with a variety of Army Aviators who ran the gamut from topnotch pilots who begrudged their every ground duty, to first rate officers who tried desperately to remain both good pilots and become effective unit officers, I feel that the premise may no longer be supportable. Army Aviation is still in a crisis of identity.

I want first class Army Aviation, the best in the world; but having commanded in combat, I also demand that officers who wear branch insignia be able to carry their load, and not have to excuse their failings by looking above their breast pockets. I have reason to doubt we can straddle the fence much longer. When good men cannot develop the abilities demanded of them, it is time to examine the system. More flying at the expense of ground training is a half-baked answer. Captain Dennison is an officer trying to do a job, caught in a dilemma not of his own making. So am I.

What is *your* answer, Army Aviation?

MAJOR DAVID R. HUGHES
2730 Bradley Circle
Annandale, Va.

Thank you. We would welcome additional comments from the field on this subject. ED

Seeding the cloud above a whiteout may lower its relative humidity, clear the area, and make for safer landings.

Putting the Squeeze On

William H. Smith

WHITEOUTS cause one of the most difficult operational problems the Army has in the arctic. When this atmospheric/surface condition occurs, everything looks white. No object casts a shadow, the horizon becomes indiscernible, and only very dark objects can be seen.

Whiteouts usually happen when snow cover is complete and the clouds are so thick and uniform that light reflected by the snow is the same intensity as the light of the sun after it passes through the clouds.

The problem is critical over flat terrain where only a few shadows exist to assist the aviator. Such an area can be found in the Greenland icecap. There, whiteouts in the inland area are associated with supercooled clouds while those along the coastline occur with warmer than freezing clouds.

The U. S. Army Cold Regions Research and Engineering Laboratory has found that whiteouts can be modified by seeding the supercooled clouds with dry ice and "warm clouds" with hygroscopic salts (readily taking up and retaining moisture) and/or carbon black.

When dry ice is dropped into relatively thin, stable layers of supercooled clouds, it induces snowfall and subsequent clearing in the seeded area. Hygroscopic salts when dropped serve as a sink for water vapor; and carbon black absorbs radiation and acts as a heat source. Each of these processes, therefore, lowers the relative humidity in the clouds. With the drying of the air, the cloud particles dissipate and clearing results.

As an experiment, the laboratory used an Otter to dispense dry ice. Five pounds of dry ice were crushed to chunks less than 1 inch in diameter and released while the aircraft flew from 50 to 100 feet above the clouds. Of eight tests, six were successful, with considerable visibility improvements and cloud dissipation. Several times the aircraft descended through the hole and landed without hazard.

The progression of events after the seeding was dramatic. Within 5 or 10 minutes the seeded area was darker and ice crystals appeared. Snow began to reach the ground in 15 to 20 minutes, and clearing began in 25 to 30 minutes. With 15 to 20 pounds of crushed dry ice, cleared areas of 10 square miles were produced.

The Russians use a different method to clear whiteouts. A cage with dry ice in it is placed on the side of the aircraft and is flown through the cloud, thus producing crystals. The drawback with this method is that the airplane must be flown through the cloud. Using pellets, the aircraft is able to fly over the cloud.

Another technique employed by the Cold Regions Research and Engineering Laboratory is to use a tethered blimp to distribute the dry ice. For this purpose, plastic mesh (berry) baskets containing the crushed ice are attached to the tethering line at 25-foot intervals.

On two occasions, with stratus ceiling of 700 and 1,200 feet and winds of 1 to 3 knots, ten baskets of dry ice were raised into the overcast. As the cloud moved through the baskets, ice crystals could be seen 100 yards downwind. After 30 minutes snow began to fall some 1 to 2 miles downwind, and there was a clearing a half mile wide in some places. The process continued for an hour and the resulting break in the clouds lasted for 2 hours.

Modification of clouds by dropping hygroscopic salts and carbon black has been tried in many parts of the world where warm clouds prevail. In some cases salts have been shot into the air by rockets. Results have been on par with dry ice seeding.

In areas where airports and landing fields must be kept open through whiteouts, cloud seeding

with dry ice, salt, or carbon black seems to be the answer. Aircraft can be used when blimps are not available or practical. Blimps employed on a large scale are ideal at permanent fields. They can be mounted on sleds and moved upwind to be ready to perform. The width of the cleared area can be controlled by the number of blimps used.

The seeding of clouds over whiteouts may not always solve the problem, but there is a good chance that it will. For that reason, units operating in whiteout areas should be prepared to squeeze the water out of those clouds if it should become necessary.

Sources

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Old Man Winter

Adapted from a safety lecture by Donald S. Buck, Director of Safety, Headquarters, U. S. Continental Army Command.

JACK FROST plays hob with safety if we aren't ready for him. During his season he increases the hours of darkness. He glazes runways with sleet, snow, or ice.

Brakes can be slightly weak and pass unnoticed during warm weather. But when the temperature drops and rain freezes on runways, those weak brakes can make life miserable for you. Jack Frost demands the best from pilots because he offers the worst.

A high degree of pessimism is needed for winter flying. One has to resolve to expect the worst and be ready for it. Consider how the first snow or the first spell of ice gets so many into trouble. Later in the season we seem to accept the fact that it is winter and operate accordingly.

It's true, perhaps, that anyone can taxi safely on ice. Trouble is, they can't stop safely. It's not the taxiing that hurts; it's that sudden stop when we slam into something solid. Remember, skids are easier to prevent than to overcome!

Skids result from changing direction or speed on slippery surfaces. The more violent the change, the more certain the skid. And the higher the speed, the harder it is to slow down or turn on slippery surfaces.

Our first rule for winter taxiing is to slow down. To safeguard against skids, keep speeds down to where you'll not have to ask for the impossible from your brakes.

Second rule is to change speed or direction gradually. A lot of pilots get into serious trouble because they forget this rule. Make no sudden changes in speed or direction. Stretch out the slow down and turn into a careful, gradual operation.

The third rule is to take it easy on the brakes. At best, braking is pretty tricky on ice or snow. Hard or long braking can cause a skid. The expert uses the gentle touch. He applies the brakes easily in a fairly rapid sequence. The intermittent application permits steering, thus helping to retain control. Of course you'll need a greater distance to stop this way, but you'll be more likely to stop where you intended to.

We need to feel like a kid riding his bicycle on a frozen pond after his first tumble. He'll turn very slowly and widely. He keeps his feet off those brakes, and he doesn't apply the power with a bang!

Sometimes despite your best efforts you'll find yourself in a skid. Curiously, your instincts are of no help in a skid. You'll feel as though you want to jam on the brakes, but that just keeps the skid alive.

To get out of a skid:

- Leave that brake alone.
- Turn into the skid. Note that we didn't say "cut sharply." Turn gradually and carefully.
- Easy on the power.

It boils down to easy on everything, and do little else but steer, if you need to get out of a skid.

Winter flying isn't so tough, provided you remain alert to the hazards. It comes down to slow, gradual, and easy. Otherwise, Old Man Winter is the winner.

FROST and FLIGHT

Richard K. Tierney

TWO U-6 BEAVERS were well out over the Polar icecap when visibility began to deteriorate. The pilots, neither instrument qualified, were forced to descend to about 200 feet in an attempt to maintain visual contact with the tractor trail they were following across the ice.

About one mile farther, visibility began falling off rapidly and the pilots had to abort the mission and return to their home base, 165 miles away.

Aboard the lead Beaver the passengers were notified of the decision. The pilot started a slow turn and almost immediately encountered a whiteout condition (see "Putting the Squeeze On," page 14). With all visual reference lost, his only choice was to go on instruments.

After completing about 90 degrees of his 180° turn, the pilot leveled off and tried to gain altitude. He was experiencing great difficulty in climbing when suddenly he felt the aircraft hit the icecap. He quickly pulled back on the controls and the U-6 bounced into a slow climb. Due to the high altitude of the icecap the pilot again experienced difficulty climbing, but eventually broke out above the whiteout condition. He circled several minutes, vainly trying to reestablish radio or visual contact with the other Beaver before returning to base.

As the pilots started to abort the mission the pilot of the second Beaver began to follow the lead aircraft into the turn. Upon entering the turn he encountered the whiteout condition, and the lead aircraft (about 700 feet ahead) disappeared from view.

While continuing the turn the second aircraft began losing altitude. The pilot was unsuccessful in his attempt to correct this and the U-6 "pancaked" into the ice-

cap. Fortunately, no fatalities resulted, and rescue helicopters arrived at the crashsite within a few hours.

Whiteout is only one of many environmental factors that affects Army Aviation's capability to provide support to all elements of the Army. Many others must be controlled if Army Aviation is to be truly combat effective. Recognizing this need, the U. S. Army Combat Developments Command Aviation Agency (USACDCAVNA) has recently completed a study to determine the capability of Army air vehicles to support operations in the following areas:

- Deserts
- Jungles
- Mountains
- Arid semi-mountains
- Snow and extreme cold
- Woods, swamps, and lakes

The study explores hazardous weather and terrain conditions encountered in these areas and offers recommendations to help control them. Recommendations are usually contained in one of the following:

Small Development Requirement (SDR)—covering projects which industry can develop or manufacture with little or no research.

Qualitative Materiel Requirement (QMR)—covering projects which can be developed with limited research.

Qualitative Materiel Developmental Objective (QMDO)—covering projects not beyond present technological capabilities and requiring extensive research.

This article deals only with USACDCAVNA's study of the effects of snow and extremely cold conditions on flight characteristics and logistics. (Other areas will be covered in future issues of the DIGEST.) Constructive criticism is welcome and can be sent to USACDCAVNA or the DIGEST (see "You—The Idea Factory," DIGEST, Oct 63).

RESTRICTED VISIBILITY

Restricted visibility is one of the chief obstacles Army Aviation faces while operating in snow and extremely cold environments. During whiteout conditions visual operations are impossible. Most missions can be accomplished using standard instruments. However, due to the complete lack of visual reference points during whiteout conditions, even instrument approaches become extremely dangerous with current systems.

Grayout is a condition in which visibility is not lost *completely*. Visual operations are possible but difficult to accomplish. Cross-reference *must* be made continually to the attitude instruments. Flight in a grayout may be compared to instrument flight between cloud layers.

The combination of grayout and fog creates a unique hazard to aviators. When viewed from above, patches of fog are indistinguishable from snow. Unknowingly a pilot may fly over surface fog for some time and then find himself in trouble when he begins letting down for a landing.

USACDCAVNA is recommending a remote area approach system which will improve flight operations under conditions of reduced visibility. Currently, aircraft cannot make low visibility approaches without ground-based equipment.

Pending development of equipment to meet requirements, current airborne FM homing equipment has been improved and allows aircraft to receive a visual readout from signals generated by the FM tactical communications radio used by troop units. It provides track information, station passage, and an indication when the aircraft is approximately one mile from the station. (Requirements call for extending this range.)

While providing an acceptable instrument approach capability, the improved FM homing system does not require additional or special training of aircrews or radio operators.

NAVIGATION

Visual navigation in snow and extreme cold weather environments is generally quite difficult. Along coasts, flat shorelines are indistinguishable from sea ice—making it necessary to fly inland in search of identifiable ground features.

The unreliability of the compass (due to attractions of mineral deposits and/or proximity to a magnetic pole), plus the absence of highways, railroads, towns, and other prominent landmarks, often makes navigation by electronic aids essential. However, in polar latitudes electronic aids can be quite unreliable due to frequent and unpredictable interference with signal emissions.

At night over the snow and ice it is necessary to rely almost completely on instruments and navigational aids. Total darkness occurs only in wide areas of open sea. In summer daylight or twilight is almost continual; in winter direct or indirect light is absent, but the snow reflects any light that reaches it. Usually enough light is reflected to make an object the size of a man visbile at 100 yards. Moonlight is quite bright and provides enough light to accomplish safe takeoffs and landings.

A need exists for a reliable navigation system for position-

ing aerial and ground elements with respect to an established electronic grid system not hampered by line-of-sight requirements. Both PFNS (see DIGEST, Feb 62) and Doppler self-contained systems are undergoing development and testing.

Other proposed aids to navigation include a lightweight single sideband (SSB) aircraft radio, an obstacle terrain avoidance system, and a light intensification system.

A materiel requirement has stated the need for a SSB radio set to maintain continuous non-line-of-sight tactical communications with compatible radio sets in ground units up to 150 miles away. This set must be operationally compatible with the 100-mile, 50-mile, and 25-mile range SSB radio sets, as well as with high frequency equipment used by other services.

An interim SSB set has been procured on a limited basis, but it is considered too heavy. Headquarters, U. S. Army Combat Developments Command is staffing a revised materiel requirement incorporating more desirable features.

A stated requirement exists for *terrain/obstacle sensing equipment* to provide selected Army aircraft with a low-level, low-visibility flight capability during tactical penetrations. This equipment must provide more than just terrain avoidance; it must, to be acceptable as a tactical aid, enable slow, low flying rotary wing aircraft to detect and avoid obstacles such as trees, poles, and wires.

Ground avoidance equipment (AN/DPW-19) is being installed in a U-9 and is programed for the OV-1 Mohawk. However, this system is only capable of detecting large obstacles such as hills and buildings. Light intensification systems discussed below may help fill the low, slow flying obstacle detection requirement.

A materiel requirement has been completed calling for a system to intensify the ambient light from the stars, moon, and reflected sources on the ground. It will be used by aircraft to detect and identify objects. It also has applications for navigation, surveillance, reconnaissance, and target acquisition during periods of nearly complete darkness. Two types are under consideration:

- The direct sighting type, which represents technical improvements of the sniperscope.
- The indirect type, or electronic presentation of a picture reproduced on a scope such as a television screen.

MAINTENANCE

Maintenance of aircraft and ground support equipment is extremely difficult and time consuming in snow and extremely cold environments. Working with bulky gloves, heavy clothing, stiff lubricating oils, and

brittle materials boosts maintenance time requirements four times over that required in a temperate zone.

Maintenance shelters are an absolute necessity if efficiency is to be improved in extremely cold areas. USACDCAVNA has completed a materiel requirement calling for a family of lightweight vans or pods capable of being air-transported. They would be designed to fulfill various shelter requirements—such as maintenance shops, aid stations, command posts, etc. To supplement this general requirement USACDC Transportation Agency is preparing a materiel requirement specifically calling for a new, compact, lightweight, air-transportable maintenance shop system to support units in areas inaccessible to ground vehicles. The system should include specially designed tool cabinets which can be used within the shop or externally as a workbench.

Also needed is an adequate shelter or family of shelters to provide workspace for the maintenance of Army aircraft. The USACDC Quartermaster Agency recently prepared a series of materiel requirements calling for three standard-size, expandable, multipurpose shelters to replace a variety of tents now in service.

LOGISTICS

Logistical support is generally accomplished with aircraft in desolate areas of extreme cold. USACDCAVNA is proposing that the Army obtain numerous items of equipment to facilitate operations in these and (when appropriate) other environments.

High on the priority list is the need for refined refueling systems and equipment which would provide the following capabilities:

- To allow single point pressure refueling/defueling in addition to the conventional over-the-wing system.
- To transport fuel in bulk containers in utility and cargo aircraft operating in the combat zone.
- To dispense fuel from bulk containers with a minimum of pumping and decontamination equipment.
- To refuel helicopters with engines running and without contamination from surrounding air, precipitation or blowing debris.
- To use selected cargo aircraft as refueling stations.
- To store fuel at fixed or semifixed airfields or secure cache points in extremely lightweight, expendable, collapsible, containers.

Five-hundred-gallon collapsible bulk fuel containers are now available. Concurrently with the development of other containers, filters, and pumping equipment, USACDCAVNA is preparing a staff paper to more clearly identify and state desired requirements.

Another logistical requirement exists for simple equipment to permit quick, accurate determination of load-carrying capabilities and center of gravity characteristics of given aircraft with various loads in varying conditions of density altitude and temperature.

Also desired are a simple device that would give the pilot a continuous inflight reading of the density altitude and a compact kit or device which would provide wind direction, velocity, and inputs necessary to compute density altitude (the latter would be used at airfields, landing sites, and by pathfinder units).

Small development requirements (SDR) have been proposed for aircraft load and performance computers and an aerology kit. The hardware development should be short range, since prototypes of the equipment have been built. An SDR also has been prepared for an instrument which would provide direct readout of density altitude.

Other items recommended to facilitate logistical support operations include skis for helicopters and a hoist for UH-1 aircraft.

Skis are required in areas where extremely deep snow prevents helicopters from landing. The Arctic Test Board is conducting tests of UH-1s using skis and other ground stabilization devices. Similar tests also will be conducted with the CH-47 Chinook, and results will provide a basis for determining application to other helicopters.

A hoist and compatible litter device is needed to enable casualties and other personnel to be lifted aboard a hovering UH-1. An SDR has been proposed to acquire a hoist (equipment is available off-the-shelf from commercial sources). The USACDC Medical Service Agency is studying requirements for a compatible litter.

Traditionally, combat operations have been hampered by adverse weather and terrain conditions. Today Army Aviation has a golden opportunity: it can turn such conditions into assets. While weather and terrain offer excellent cover and concealment, they also stymie ground vehicles. On the other hand, Army aircraft can be flown in the nap of the earth *and* in marginal weather. By further developing these capabilities with improved equipment and tactical procedures, Army Aviation will become the supporting element the ground commander *depends on.*

make a bump like that."

Seconds later the copilot exclaimed, "There it is again; what is it?"

The pilot, now also showing signs of nervousness, responded, "I don't know; it could be an engine starting to run a little rough, but the tach looks all right and all of the other instruments seem to be in order." Famous last words!

As the spray of snow settles, the badly battered CV-2 is revealed, resting at an awkward angle in the snow. What happened? These pilots had had their first experience with two phenomena characteristic of the Arctic: grayout and a gross al-

Human Factors In Co

Wallace W. Prophet, Ph.D.

THE CV-2 DRONED monotonously through the cold winter twilight. Below, the snow-covered landscape stretched forth in a seemingly endless mass of whiteness. Occasional snowflakes from the overcast flicked against the windshield. All in all, it appeared to be a pretty routine flight. Inside the cockpit, the pilot and copilot went about their duties in a reasonably comfortable environment. However, each was beginning to show signs of strain from the long flight.

The copilot, a young lieutenant getting his first real taste of cold weather operations, was speaking, "Jack, I can't raise anyone at the field. I figure we're still about 30 minutes out. Do you think we can stay VFR or will we have to pull up into this stuff?"

The pilot, a captain who had made this same flight twice before, replied, "No sweat. That ceiling is still about 1,000 feet and I can make out most of the features on the ground. I don't think we have anything to worry about. The map shows this area doesn't have any significant hills or mountains. We're in good shape. Besides, as you said, we should be there pretty soon."

A moment later the copilot asked nervously, "What was that? Did you feel a bump, Jack? Could we be picking up some ice?"

The pilot replied somewhat uncertainly, "Yeah, I felt it, but ice slinging off the props doesn't

timeter error. Because of these phenomena, they unwittingly flew their aircraft into the snow-covered ground.

While the preceding anecdote is fiction, the phenomena are brutally real and have resulted in crashes like the one described. How do such happenings come about? Part of the difficulty results from failure to recognize some of the human factors problems inherent in cold weather

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In Cold Weather Operation

Russel E. Schulz

operations. However, all areas have their particular human factors problems.

When cold weather operations are mentioned, the pilot usually thinks of cold weather effects on aircraft. These frequently require special techniques of aircraft operation by the pilot. However, cold weather also has pronounced effects on the pilot's perceptual discriminations and ability to perform in the aircraft. We refer to these effects on the pilot and crew members as human factors considerations in cold weather operations.

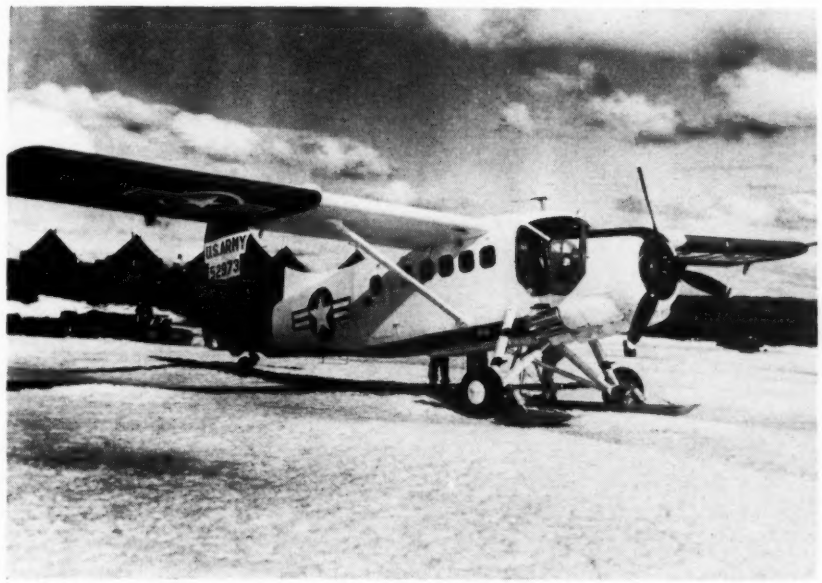
Grayout and whiteout are two conditions associated with Arctic operation which have disruptive effects on the pilot's visual perception. Each of these conditions can lead to the aviator's complete inability to perceive accurately on the basis of contact visual cues. Whiteout and grayout result from a combination of lighting and atmospheric conditions that reduce the pilot's visual field to an indistinct or easily misinterpreted set of cues.

The grayout phenomenon occurs during periods of long twilight, particularly when the sky is overcast. Grayout does not affect perception of the horizon, as does whiteout, but rather the perception of near objects, the ground beneath the aircraft, and estimation of height above the ground. It is probably a more dangerous situation than whiteout, because a pilot may not even recognize that he is flying in a grayout condition.

In the anecdote, the pilots were flying in a grayout condition. They perceived their height above the ground as being several hundred feet, but the noise and vibration they heard and felt were actually the propellers of the aircraft hitting snowdrifts. Eventually, they flew into the ground and crashed.

Their altimeter indicated an altitude of over 700 feet. The pilots, however, didn't realize their altimeter was in error, on the dangerous side, by over 700 feet. They didn't know that large errors in pressure altitude, caused by cyclonic activity and below-standard temperatures, are *common* in the Arctic. More importantly, from the human factors point of view, they did not realize that their senses might deceive them when they tried to crosscheck their altitude by VFR reference.

All aviators must recognize that their sensory and perceptual mechanisms operate in accord with certain physiological and psychological laws and that our senses can play tricks on us, especially under unusual environmental conditions. Our best defence under such circumstances is to know when to expect these limitations and take appropriate action.



Cold weather operations bring about a number of other human factors problems, mainly those concerned with operations inside the cockpit. For example, more and more reliance is being placed on warning lights for aircraft system malfunctions. Occasionally cold weather can cause the warning light system to malfunction so that we receive insufficient or incorrect information. Therefore, it is a good idea for the cold weather pilot to crosscheck the engine instruments more frequently and carefully and to integrate and use all of the available information concerning the condition of the aircraft.

Many of the precise manipulative skills of the aviator, such as the positioning of switches, fuel selectors, and other controls, may depend very heavily upon tactual feedback for their correct performance. The wearing of heavy gloves or mittens may grossly reduce the feedback that normally occurs through the sense of touch. Bulky gloves and mittens may also result in inadvertent activation of switches and controls. Therefore, the cold weather pilot again is cautioned to crosscheck very carefully all of his actions when he is wearing such clothing.

A number of psychological and human factors problems are associated with cold weather operation that are not related directly to equipment operation. Obviously, cold weather can be extremely uncomfortable and can produce significant decrements in man's ability to function. Many people have the mistaken concept that the weather necessitates an immobile, indoor existence. As a consequence, such assignments often have a number of psychological effects on an individual's performance as a soldier. The individual must be taught that he can operate effectively in a cold weather environment.

Several years ago, the Human Resources Research Office (HumRRO) undertook a study entitled COLDSPOT. One of the principal goals was to determine the problems faced by the men on military operations in the Far North and to identify those problems for which human factors research might be of some help. Over 500 officers and men located at various Army outposts in the Far North were interviewed. Several of the conclusions from these interviews are pertinent to aviation.

The effectiveness of any military unit is determined in large part by the motivation of the individual soldiers and the morale of the group as a whole. Even with the best of training, the unit will not function effectively if motivation and morale are low.

In Task COLDSPOT, comparisons in motivation and morale were made between officers and enlisted men of two different types of units assigned to Greenland. The groups differed in housing, food, entertainment, and working conditions. One group lived in barracks-type buildings; the other lived in canvas jamesway huts. Frozen and fresh foods were provided for one group versus frequent C-rations for the other. One group had entertainment facilities; and the other had none. One group worked normal duty hours in heated buildings; the other had long duty hours outdoors.

Contrary to common expectations, the group with good housing, food, entertainment facilities, and normal duty hours indicated a significantly lower level of individual motivation and group morale than the group operating under the more difficult conditions! Obviously, exposure to cold weather per se did not have a deleterious effect on motivation and morale. Additionally, comfortable facilities and normal working hours, in

themselves, did not produce high motivation and morale.

What, then, produced the low morale in the one group? It appears that the major contributing factor was plain boredom, lack of change in the day-to-day activities. This group was assigned to Greenland for the sole purpose of defending the Thule area. They performed the same duties day after day, and frequently they were confined to their unit areas for relatively long periods. On the other hand, the high morale group was assigned as a support unit to various scientific research studies being conducted on or near the Greenland ice cap. Their day-to-day activities changed frequently, both in the nature and location of their work. This diversity of duties appears to have been important in producing high morale.

What should the COLDSPOT findings mean to aviators and commanders of aviation field units? Aviation support units frequently are pretty well isolated with regard to their day-to-day maneuverability and routine, especially in cold weather areas. They may have very little opportunity for change in their operation. On the other hand, aviators have greater mobility and a wider range of change in routine due to the frequent changes in flying conditions associated with cold weather environments. Therefore, if cold weather restrictions are severe enough that the support personnel must stay in camp day after day, then motivation and morale problems may crop up in aviation units.

It is important that the commander of such a unit realize that a lowering of motivation and morale can easily occur as a function of the relatively isolated conditions under which the support personnel must work. It might be wise to systematically attempt to give breaks in the routine for each individual concerned. Leadership is extremely important in such a situation.

In some instances it is not possible to provide breaks in the routine. Selection and training may help minimize some of the difficulties. Unfortunately, little information exists concerning the extent to which interpersonal conflicts and irritations are related to basic personality traits of the individuals involved and the extent to which they are common to all individuals. It is not known whether individuals can be selected who will tolerate this sort of environment more readily than others or whether individuals can be trained so their attitudes do not bring them into major conflict with their associates.

Another point noted in COLDSPOT was that many non-aviator commanders did not realize the capabilities of aviation in general and the limitations that might be placed on these capabilities during cold weather operation. Therefore, the Army Aviator has an educational function to perform, especially with respect to cold weather operation. For example, unit commanders must realize that cold weather necessitates certain procedures, such as preheating aircraft engines, that may significantly alter the response time of aviation units.

At the present time, we know a great deal more about the procedures of operating aircraft in cold weather than we do about the human factors involved. Human factors research by organizations similar to HumRRO, as well as research by operational field units, is of prime importance in the effective operation of aircraft and aviation units in cold weather environments.

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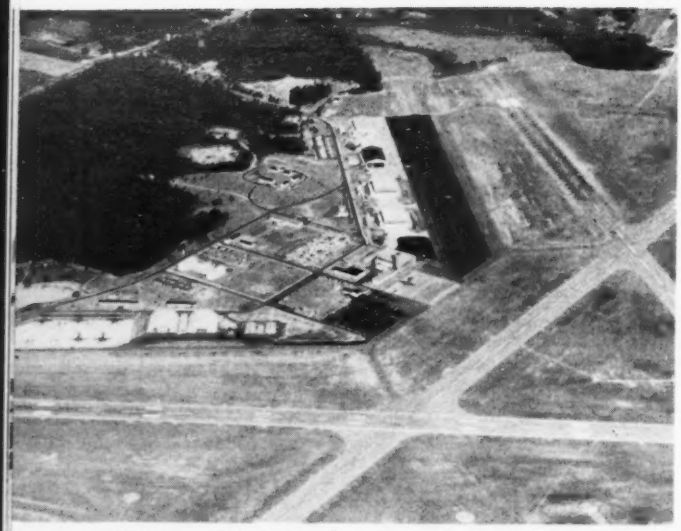

Cairns AAF is the Army's most completely instrumented airfield

WACs now assist in the operation of flight dispatch desks and towers

New aprons give Hanchey AAF, world's largest heliport, 450,000 sq. yds. of pavement

The $260,000 NCO club under construction will be one of the Army's finest

FORT RUCKER, Ala., is one of the Army's fas owing criterion. Since the master building plan was firs eived i type construction at the U. S. Army Aviation Center er $50 building program is complete.

Of the $51 million already spent, $25 million was apeha the post 1,528 permanent quarters. The other $26 mi was sp and roads.

The FY 1963 building program included two ba headq complex area; two academic classroom buildings con six c with cafeteria, gymnasium, and auditorium; two 40-BOQs; of Fort Rucker; and additional aprons at Hanchey A

Approved for FY 1964 are two hangars with shops briefin repacking building on the main post, thr man B AAF. Also planned is a 75-bed hospital w will inc Medical Division. The new hospital wil ocated

Planned for FY 1965 are eight more emic c pacity flight instructor building, a new eadqu for the temporary structure housing the ssary

Two golf courses afford recreation and provide emergency landing areas

Illustrating the expansion of Army Aviation are these Caribou lined up at Cairns AAF

si Buildup
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's fa owing installations, if construction can be used as a
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enter er $50 million will be spent for construction before the

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26 mi was spent for permanent buildings, hangars, airfields,

o ba headquarters and classroom buildings in the barracks
s con six classrooms each; an elementary school complete
o 40 BOQs; a large stagefield located about 15 miles south
ey A

shops briefing rooms to be built at Hanchey AAF, a parachute
, thr man BOQs, and a trainer building at Shell
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mor emic classroom buildings, a 314-man ca-
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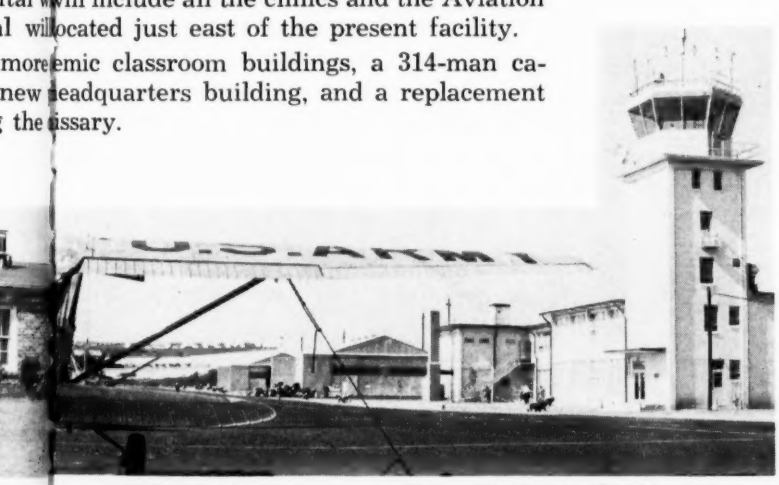
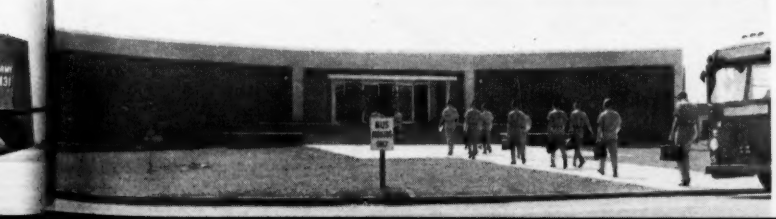
the issary.

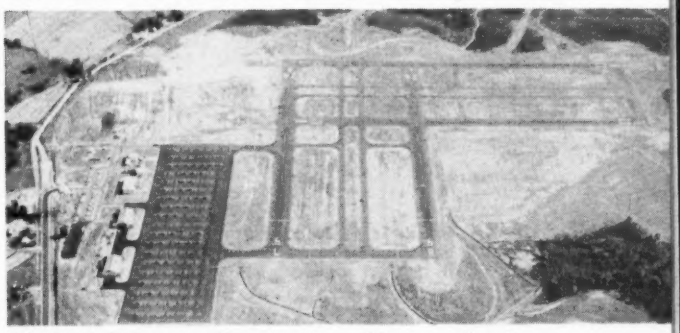


Shell AAF tower is Fort Rucker's busiest, handling 390,858 takeoffs and landings in FY 63

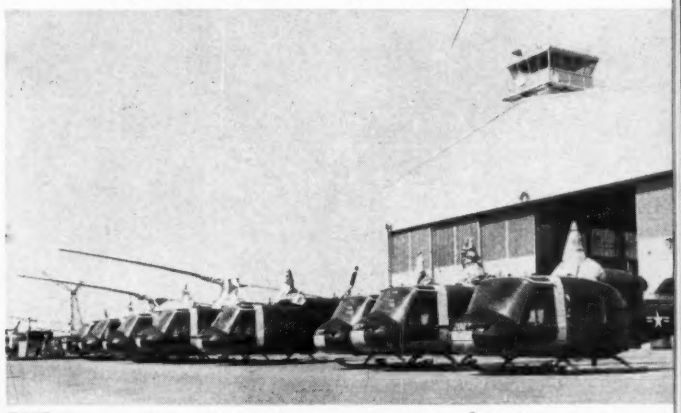
Modern academic buildings furnish functional, up-to-date classrooms for instruction



New headquarters and classroom buildings have been added to the barracks complex area



Shell AAF near Enterprise, Ala., is the home of primary fixed wing training



UH-1s continue to arrive to support the increased pilot training program

Beautiful Lake Lodge is a branch of the Fort Rucker Officers' Open Mess

Light Aircraft Icing

ICE IS FINE for skaters, but it can be hard on airplanes and even harder on the pilots.

Both external icing and internal carburetor system icing can seriously affect aircraft performance. Failure to detect and combat these conditions results in many accidents and critical incidents every winter.

Ice accumulation can be slow or dangerously rapid, depending upon the moisture content and temperature of the air. External icing is most probable when flying in air with visible moisture (clouds, drizzle, rain or wet snow) and at temperatures from 32 to 20 degrees Fahrenheit. However, it also can occur in temperatures as low as minus 30 degrees.

Ice is particularly hazardous when permitted to accumulate on or in the wing and tail surfaces, propeller, pitot or static air pressure sources, and carburetor.

The first sign of wing ice is a thin ribbon along the leading edge which gradually builds forward into the airstream and vertically toward the top and bottom surfaces of the wing. Since the wing is carefully designed to permit a smooth flow of air over its surfaces, any change in the leading edge disrupts the airflow and reduces the available lift while increasing the drag force acting upon the wing.

Reprinted from Flight Safety Foundation, Inc., Pilots Safety Exchange Bulletin 63-108/109, September-October 1963.

It is not the weight of the ice, however, but the shape that presents the hazard. The blunter the ice formation, the more the airflow is disrupted. The resulting decrease in lift and increase in drag can force an airplane to make an emergency landing.

Pilots also should bear in mind that even a small amount of wing ice will increase the stall speed of light airplanes. This is particularly critical in approach and landing situations.

Ice on the tail assembly disrupts the airflow, just as it does on the wings. An early indication of ice on these surfaces may be a tendency of the tail to swing, or possibly a vibration that on some aircraft can become heavy enough to cause structural failure. Ice formation also can jam flight control surfaces on both the wings and tail.

An accumulation of ice on propeller surfaces changes the shape of the blades and sharply reduces propeller efficiency. As ice forms on the propeller, more power goes into overcoming the increased drag of the blades and less into the thrust necessary to maintain flying speed. If this condition is permitted to go unchecked, the results can be disastrous.

Freezing of the outside pitot and static air pressure sources will change the pressure transmitted to the airspeed, altitude, and rate-of-climb instruments and cause incorrect readings. Outside venturi units, which are not located within the engine's exhaust gases, also are very susceptible to icing and can result in erroneous altitude and direction indications. Either condition can seriously imperil aircraft performance.

Carburetor icing is an extremely serious problem because it can result in a critical power loss. It has the same effect as slowly closing the throttle—it cuts down the amount of fuel mixture reaching the cylinders.

Unlike external icing, carburetor icing does not depend on visible moisture in the atmosphere or on freezing temperatures. It is most probable at temperatures between 40 and 60 degrees but can occur at temperatures as high as 90 degrees. The temperature range and the degree to which a carburetor is subject to icing depends on its particular design and installation. Pilots should refer to the airplane manufacturer's manual on the operation of the engine for detailed information on coping with carburetor icing.

Proper de-icing equipment and procedures will help pilots to combat icing in critical areas. Temporary protection of external surfaces also may be obtained by application of a commercial

Continued on page 29

Cold Injuries

RECENTLY WE questioned Maj James E. Hertzog, Chief of Aeromedical Education and Training, U. S. Army Hospital, Fort Rucker, Ala., on the subject of cold weather injuries. It went like this:

Doctor, I'd like to talk about cold weather injuries and the things that happen to men caught out in the cold wastelands of the Far North.

Why go way up there to find cold weather injuries? Let's stay close to Fort Rucker and talk about the injuries we have down here in the Third Army area.

You mean we have cold injuries down here in the Sunny South?

We sure do. As a matter of fact, it is possible to have cold injuries in all Army areas of the United States. Here in the Third Army area we had 75 men hospitalized or confined to quarters last year because of cold injuries. Last year cold injuries in this Army area alone cost the Army some $178,777.

What are the different kinds of cold injuries?

The three most common are hypothermia, frostbite, and trench (immersion) foot. When the entire body is exposed to cold to the point that vital functions cease, it is called hypothermia. Frostbite is local tissue death from exposure to cold below freezing. Trench (or immersion) foot is local tissue death from exposure to cold above the freezing temperature.

What type is experienced most often by aviation personnel?

Minor frostbite. Like sunburn, frostbite can be prevented and is usually the result of negligence. In most cases it is considered a non-line-of-duty injury. So the usual result is that personnel do not report minor frostbite injury.

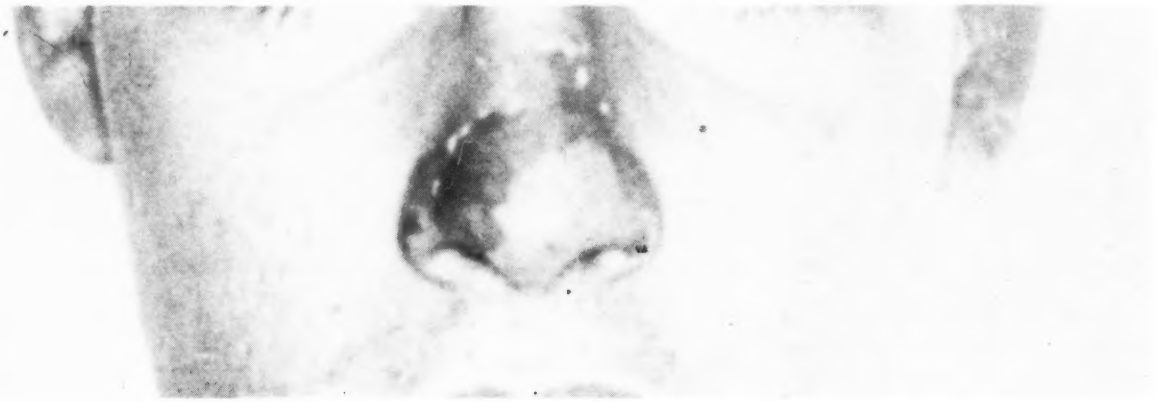
Are some people more susceptible to cold injury than others?

No. However, a man who has never experienced extreme cold is not as aware of the danger as is someone who has lived with it. He is more likely to be careless and get bit. Each person has a cold tolerance upon which his ability to withstand cold depends.

Part of this tolerance is due to the fat that lies just below the skin. The greater the thickness of this fat, the greater the insulation against heat loss. This is one of the few advantages a fat man has over a thin one.

The most serious cold injury we had in the Third Army last year was a case of frostbite received by an officer from Fort Benning on a tactical problem in the foothills of the Alleghenies in North Georgia. When his unit arrived, the temperature was over 40°. A cold front moved in unexpectedly and in 24 hours the temperature dropped to 6° below.

The lieutenant had a history of cold injury and was admitted to the hospital with frostbite of the nose, left ear, and both hands and feet (see photos).



Is there such a thing as immunity to frostbite?

No. In fact, once you have suffered frostbite you become less tolerant to the cold. Your susceptibility to cold injury following extreme exposure is greatly increased.

And where you live has no effect upon your cold tolerance?

That's right. However, you do become acclimatized after two or three weeks in any particular location.

Ever notice how the first cold snap of the year worries people? After months of hot weather they are not acclimatized to cold. The first 40° day of fall feels much colder than the last 40° day in spring.

Doctor, suppose you are caught out in the cold, what can you do to prevent cold injury?

Well, you can't do much if you are not prepared. A pretty girl in a bathing suit can't keep warm in a snowstorm no matter how hard she tries.

It's pretty hard for an aviator in an area of relatively mild winter weather to envision what he should wear in 4-foot snowdrifts and a −20° temperature. Yet, that is exactly what must be done.

In some parts of the Southwest you can be in a desert area with 90° heat and in 10 minutes be in an area of extreme cold. All who board a military aircraft should take along a minimum of personal gear to assure survival under the most severe conditions that could be encountered en route.

Now if I were out in the cold and unprepared for it, I think the first thing I would do is to get out of the wind. The chill factor, at any temperature, is in proportion to the wind. A rule of thumb is a 30-second exposure in −30° temperature will cause frostbite in 30 seconds. So shelter from the wind is very important.

Then I'd try building a fire to warm by. Warm the extremities of your body but, of course, don't overdo it. Even the smallest fire will help. I know of one soldier who put a candle in a tin can and warmed his hands and feet enough to prevent cold injury.

And above all stay dry. Don't even work up a sweat. If you do get wet or your clothes become damp, the first order of the day is to get dry.

If you feel you are suffering any of the three cold injuries you mentioned, what should you do until you get to a doctor?

Someone suffering from hypothermia should be rewarmed immediately if he is to survive. He should be exposed to temperatures of about 120° F. This may be accomplished by using warmed water (feels warm to the skin on forearm) or a warmed room. In the case of hypothermia, the patient is usually not able to care for himself and must be assisted.

But in the case of frostbite the patient can help himself. As quickly as possible he should re-

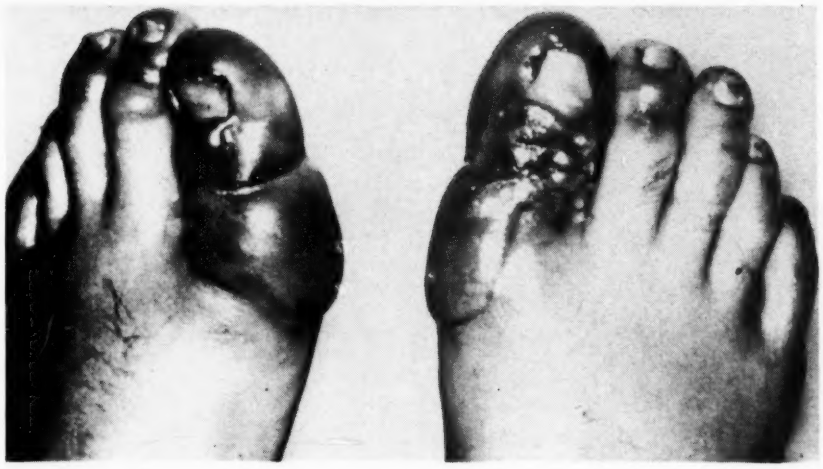
warm the affected part to about 90°-104°. This can be done in front of a fire or by placing the injured extremity against or between other parts of the body.

In the case of trench foot, rewarm the injured part to 70°-80°. Water may be used here, and it should feel slightly cool to the forearm. After warming, protect the injured part with dry dressing and treat the patient as a litter case.

I noticed that you said to rewarm a frostbitten part as quickly as possible. I have always been told to gradually thaw the frostbitten part with snow or cold water.

That old theory is obsolete and is more injurious than helpful.

Up to now we've talked about the extreme cases of cold injury. What is the effect upon an aviator if he fails to dress properly while flying?



The loss of heat by radiation can have a dangerous effect upon the body, especially to the aviator. Humans seem to lose their skill in direct proportion to the coldness of their body. A cold aviator takes longer to react to external stimuli.

Also, you must remember that aviators depend to great extent upon their sense of touch in the adjustment of instruments and maneuvering the aircraft. When his hands are cold, the aviator loses a great deal of this sense of touch and therefore becomes less effective.

My advice is to dress for the temperature expected inside the cockpit and to carry along enough clothes to take care of an emergency en route.

Continued from page 26

anti-ice preparation prior to takeoff.

The best guarantee of safe winter flying, however, is for pilots to avoid conditions conducive to icing whenever possible. The U. S. Weather Bureau's forecasts and reports of icing conditions are invaluable aids here. These conditions are defined by the Weather Bureau as follows:

Light icing—An accumulation of ice which can be disposed of by operating de-icing equipment and which presents no serious hazard.

Moderate icing—De-icing procedures provide marginal protection. The ice continues to accumulate but not at a rate fast enough to affect the safety of flight unless it continues over an extended period of time.

Heavy icing—Ice continues to form despite de-icing procedures. It is sufficiently serious to cause marked alteration in speed and altitude and would seriously affect the safety of flight.

Pilots should steer clear of heavy and moderate icing conditions and proceed with caution into areas where light to moderate icing is forecast. If heavy icing is encountered unexpectedly or unavoidably, prompt action should be taken to get into more favorable flying weather. To delay such evasive action is to court disaster.

The RIGHT Way to Jump from Army Aircraft

In the August 1963 DIGEST, the article "Jumping from Army Aircraft" and accompanying photographs contained jump techniques not in accordance with TM 57-220. To rectify any impression of sanctioning unauthorized procedures, we publish the following article which is in accordance with TM 57-220.

"GO!"

The captain flying the CH-21 over the Vietnamese jungle had given the 1-minute warning. He didn't hear the jumpmaster's "Go" 60 seconds later; but as the Shawnee passed over the drop zone he was certain it had been given. He was conscious of every vibration and movement of his aircraft and knew instantly when the troops began moving through the forward door.

While holding the aircraft steady at 40 knots, he glanced back over his right shoulder and caught a glimpse of the last parachutist leaving the aircraft. Below the flight of helicopters, scores of Vietnamese troops drifted down toward a fortified village which a company of Viet Cong troops was attacking.

Army escort helicopters returned fire on the enemy in conjunction with local security forces from the village to protect the descending parachutists. Before the flight of helicopters was out of the area the parachutists had joined the fight and the Viet Cong was withdrawing in defeat.

This type of operation is only one of many ways in which Army Aviation supports the ground commander. But it is also one of the *most effective*, especially when parachutists must be hurriedly deployed within the combat zone. The ground commander can depend on immediate responsiveness from Army Aviators and aircraft under *his* command.

If Army Aviation is to continue to be depended on, it must continue to offer effective and efficient support. Understanding the techniques of jumping from Army aircraft will help achieve this goal.

THE JUMPMASTER

The Army Aviator and the jumpmaster must work together as a team. Before the flight the jumpmaster and aviator discuss the drop zone location and the type of approach pattern; exchange information concerning altitudes, speeds, winds; and determine the air release point.

The pilot preflights his aircraft, and with the jumpmaster, makes sure the aircraft is properly prepared for jumping. The jumpmaster inspects the parachutists and their equipment and holds a final briefing before giving the command to board the aircraft.

During the flight the jumpmaster is in constant communication with the pilot or crew-chief on the progress of the flight. He is also responsible for the conduct and safety of his troops during the flight.

The pilot gives the jumpmaster 20-minute, 4-minute (6-minute in CH-34 and CH-37) and 1-minute warnings of the approach to the drop zone and informs him when the aircraft is at jump speed and altitude. The jumpmaster organizes the parachutists for the jump and when over the release point gives the command to "go." In tactical units the jumpmaster usually jumps with the troops. During parachute qualification training he normally does not.

Figure 1

ARMY AIRCRAFT

Army aircraft used in jumping troops include the U-6A, U-1A, CV-2B, UH-19, CH-21, UH-1, CH-34, CH-37 and CH-47A. Before discussing jump procedures from these aircraft, it should be pointed out that personnel cannot safely parachute from hovering helicopters because of the downwash which interferes with the canopy and/or static line. To accomplish jumps, forward speed must be maintained; however, if the speed is excessive the parachutist may be thrown into aft sections of the helicopter. Therefore, minimum and maximum helicopter jump speeds are stated in TM 57-220. According to para. 98, if not otherwise specified, helicopters should slow to 50-70 knots.

U-6A Beaver: This aircraft carries up to four parachutists. The rear seats are removed and the troops sit on the floor facing each other. At the 1-minute warning the first man swings his legs out the port door and rests his feet on the step. Ten seconds from drop time he leans forward, assuming the position shown in figure 1. (All figures illustrate door positions only. The aircraft have not been taped or padded for jumping.) Upon jumping he pushes straight out. The other jumpers do not use the step; they sit in the door with their hands grasping the edge of the floor (figure 2). To exit, they push off with their hands. (The first jumper may also use this procedure if desired.) when the jumpers have exited the copilot or safety NCO recovers the static lines. Only the port door is used for jumping, and because of cramped space only experienced parachutists jump from the U-6A.

U-1A Otter: Up to five parachutists may be jumped from the U-1A. They sit in the standard seats—two on the port side and the rest starboard. Upon command, the parachutists secure their seats in the "up" position, hook up and sit on the floor facing the port side. One minute out, the first jumper sits in the door with his feet outside and his hands grasping the door sill (figure 3). Upon leaving he pushes up and out. The others exit in the same manner. Only the port door is used for jumping.

CV-2B Caribou: The CV-2B has now received final jump clearance. It will accommodate 24 parachutists who may exit from either of the side doors or off the back ramp (figure 4).

Simultaneous exits are not made while jumping from the side doors. Parachutist No. 1 jumps from the starboard door; then No. 2 leaves through the port door. The rest of the jumpers alternate exits at 1-second intervals.

When exiting off the aft ramp, the odd-numbered men hook up and stand one behind the other on the starboard side. Even numbers are to the port side, slightly to the rear of the odd numbered jumpers. No. 1 exits first, taking 3 steps down the ramp, which has been inclined 15 degrees below the horizontal. No. 2 goes next the same way and the remainder follow (alternating).

UH-19 Chickasaw: Up to five parachutists are carried in this aircraft. The jumper sits in cargo door (figure 5), similar to the position used in the Otter. He exits straight outward by pushing down and outward with his hands, thus clearing the right rear wheel by about 4 feet.

CH-21 Shawnee: Ten parachutists are the maximum to be jumped in one stick from the

Figure 2

Figure 3

Figure 4

Figure 5

CH-21. If allowable cargo load permits, 12 parachutists may be jumped in two or more smaller sticks in multiple passes over the drop zone. Troops are seated on both sides of the helicopter and upon command secure their seats in the "up" position. Troops exit out of the small forward door. The jumper must keep the upper part of his body straight, but still crouch enough to allow at least a 2-inch clearance between his helmet and the top of the door (figure 6). He jumps straight out and then assumes a normal body position. Troops exit only from the right front door.

CH-34 Choctaw: The CH-34 carries up to 10 parachutists. The jumper sits in the door with his feet outside and his hands grasp the door sill (figure 7). He exits upward and outward. All parachutists exit in a similar manner.

CH-37 Mojave: Twenty-three parachutists are the maximum that can jump in one group. Even-numbered jumpers sit on the port side; they stand up and hook up prior to the odd-numbered jumpers on the starboard side. While preparing to exit the jumper stands in a normal position in the door. Upon command he makes a normal exit.

CH-47A Chinook: Procedures for jumping from the Chinook will be included in the next revision of TM 57-220.

UH-1A/B Iroquois: Up to five can jump from the A or B model Iroquois. Parachutists sit on the floor until the aircraft is 30 seconds from the drop zone. Then, the No. 1 jumper centers himself in the right cargo door with both feet placed firmly on the landing skid and both hands (palms down) on the floor alongside his thighs (see figure 8). He turns his head to his left, toward the jumpmaster. When jumping he pushes up and out with both hands. The others follow in similar fashion. Jump procedures for the UH-1D also have been approved and will be published in the next revision of TM 57-220.

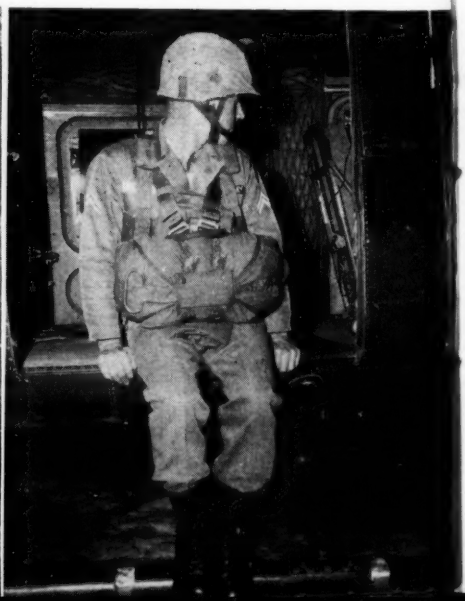
To achieve the highest degree of safety in jumping from Army aircraft, it is mandatory to establish and abide by standard procedures that have been thoroughly evaluated. When an individual feels he has an improved jump procedure, he should forward his recommendations to the U. S. Army Infantry School, Fort Benning, Ga. Such recommendations are welcomed, and will be thoroughly evaluated and if appropriate adopted as standard techniques. TM 57-220 is now under revision. One of the changes anticipated is standardization of the 6-minute warning for all aircraft.

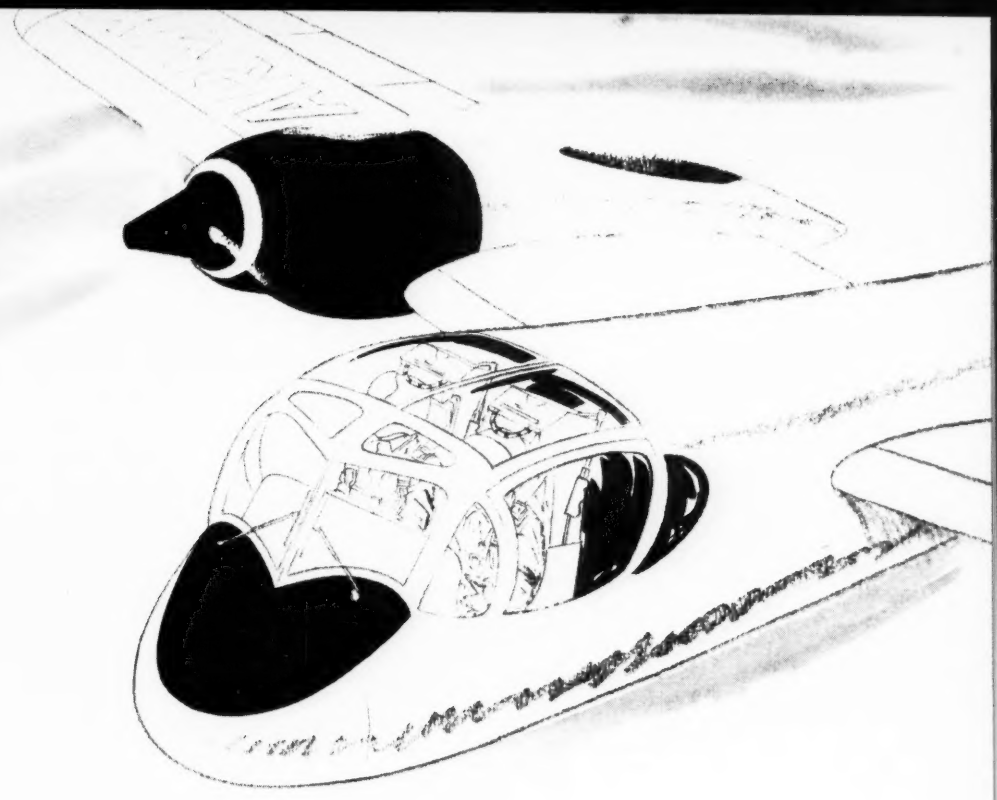
The Army Aviator plays a key role in the successful employment of parachutists. Together, the Army Aviator and the parachutist provide the Army with a powerful "one-two" punch.

Figure 6

Figure 7

Figure 8





EMERGENCY SITUATIONS

Gerard M. Bruggink

THE MONOTONY of your flight is shattered by an explosion and a glaring red light on the panel. What are you going to do, besides making the obvious conclusion that your hearing and eyesight, and the bulb in the warning light are in fine working order?

The system that produced you expects you to deal with this and any other emergency as follows:

1. Assess the nature and seriousness of the emergency. (Time available may vary from a split second to a few hours.)

2. Decide on the best course of action, based on your total knowledge of the aircraft and your evaluation of the circumstances. (Choices may vary between immediate ejection, bailout, or crash landing, and continuation of the mission with certain precautions.)

3. Concentrate on the execution of your plan with due regard for the safety of the airplane and its occupants. (Your expert knowledge is considered a warranty against confusion, panic, and petrified crew members.)

Sounds like too big an order? If you were not judged capable of dealing with every possible contingency, somebody else would occupy your seat. Don't underestimate your own ability and responsibility in an emergency situation. You may fall in the hands of an investigation board that needs as many days as you had seconds to analyze your predicament. From behind a barricade of cigar smoke and technical manuals, these gentlemen will question your actions to the point that you

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feel like screaming: "I'm not the d—— aircraft designer. Ask the people who sold us that bill of goods."

Let's savor this unpopular situation for a moment: a pilot just back from the twilight zone, being grilled by a board that works on the flattering assumption that the pilot is an expert who can rationalize his actions without any need for embarrassment. The pilot is concerned about his reputation, while the board members are trying to determine if the pilot's experience forms a basis for improvements in training, procedures, or design. Unfortunately, many pilots go on the defensive when confronted—in their own analysis of the events—with gaps in their knowledge and try to justify their actions in the light of what they did know, rather than what they should have known at the time.

Although a board inquisition will convince any pilot, for life, of the need to prepare himself for emergencies while there is time, it is a questionable privilege, especially when you may not be around to play the main role. The following discussion is intended to stimulate the proper attitude towards emergencies the painless way, by provoking you to be your own inquisitor while everything's still in the green.

EMERGENCIES VS ACCIDENTS

Our interest in emergencies is, or rather should be, based on their accident potential. When the accident potential of an unusual situation is as clear as daylight, there is seldom a delay in crew response. In too many cases, however, pilots do not recognize an emergency situation or its seriousness until they are faced with the inevitable; they lose initiative while underestimating or ignoring the symptoms of trouble. We may have to do here with an "it can't-happen-to-me" attitude which is a reflection of modern society's tendency to ignore and avoid the unpleasant. A level-headed pilot is not an escapist; he considers as an emergency ANY UNPLANNED COMBINATION OF CIRCUMSTANCES THAT INCREASES THE NORMAL HAZARDS OF FLIGHT.

There is a popular belief that any accident preceded by an emergency situation automatically relieves the pilot from all responsibility. If this were true, we would be wasting our time trying to prepare pilots for emergencies. Actually, the relationship between emergencies and accidents is similar to that between love and offspring; you can have one without the other, depending on the attitude and the skill of the personnel involved. The role played by the pilot in the emergency/accident relationship can best be explained by a typical example: engine failure on takeoff.

A U-1A took off from a 5,000-foot runway into a 15-25 mph wind. After becoming airborne, the engine began to malfunction. The pilot started a left-hand, downwind turn with partial power when about 200 feet above the terrain. During the turn the engine stopped completely. The aircraft settled to the ground at a flight path and impact angle of about 30°. Upon first impact the landing gear collapsed and the aircraft burst into flames. The six occupants survived.

According to the accident report the main accident cause factors were engine failure and unevenness of the terrain. Some relevant statements from the crew members, as reported by the first witnesses to arrive at the scene, give a different impression: "I tried to pull it up to get more altitude but it just wouldn't climb" (pilot); "We should have kept it into the wind" (copilot).

Depending on the situation and the pilot's reaction, this type of an emergency can result in:

1. A forced landing without damage (not an accident).

2. A forced landing with damage due solely to the unsuitability of the *available* terrain (an accident attributed to engine failure only).

3. An uncontrolled crash due to poor pilot technique (an accident attributed to engine failure as well as pilot technique).

The classification of this takeoff accident is left to the reader's judgment. The thing to remember is that an emergency does not become an accident until the aircraft sustains damage. The pilot's actions under these circumstances must be judged from the standpoint: What could he reasonably be expected to know and to do?

TYPES OF EMERGENCIES

Theoretically, a pilot has to be prepared for at least as many types of emergencies as there are components in an aircraft. In practice, this presents a highly optimistic point of view; if our emergencies were caused by hardware malfunctions only, we could stop worrying about the inventiveness of pilots in creating emergencies. To stay within the scope and purpose of this discus-

sion, emergencies will be broken down into three categories: standard, nonstandard, and self-imposed.

STANDARD EMERGENCIES

Acknowledging the existence of standard emergencies is not a sick joke; it is a reference to the "standardized" emergency instructions in our operator manuals. There are pilots who judge the reliability of an airplane by the number of these red pages, on the assumption that they reflect the manufacturer's lack of confidence in his product. A more prudent attitude would be to assume that these "canned" emergency procedures reflect the manufacturer's pessimism concerning the pilot's knowledge of his aircraft.

It is not sufficient to pass a multiple-choice exam on the handbook, including emergencies, and to proceed from there on with the smugness and self-assurance of a hood who just discovered the Fifth Amendment. Emergencies do not occur in a classroom atmosphere. Many of them are upsetting, and unless the pilot has conditioned himself through knowledge and mental discipline to react properly under stress, he may not regain his composure in time.

How well do we prepare our pilots for standard emergencies? As long as they are in training status, we do a conscientious job; we keep them on the ball by cutting the power on them with merciless irregularity and by demanding a knowledge of the aircraft that approaches that of the designer. But what happens after they get their wings and enjoy a degree of independence not shared by their colleagues in the other services? We allow them to develop the attitude that the end of their formal training is the end of the learning process, as evidenced by the following example.

Shortly after a normal takeoff, a U-8 pilot experienced difficulties as the result of a mechanical failure in the gear retraction and extension system. This was a "standard" emergency, provided for in the handbook with a simple, well illustrated, 4-step procedure to extend and lock the gear. For about 1 hour and 40 minutes the crew tried to get three in the green, assisted by the combined knowledge of two U-8 instructors in the tower. Finally the aircraft was landed on a foamed runway with unsafe gear indications; the nose gear promptly collapsed.

Standard emergency, engine failure

The cause of this embarrassing mishap? Everybody assumed that the pilot had properly executed the emergency gear extension procedures. As it turned out, he had failed to take two of the four required steps (pulling a circuit breaker and disengaging a clutch).

There is no need to expose other red faces in our ranks. Let it suffice to say that it's not always the inexperienced pilot who allows emergencies to turn into accidents for such poor reasons as failure to maintain airspeed, to drop heavy external stores, or to select the fullest fuel tank after an engine quits. It appears that one of the greatest hazards for the younger pilot is not the equipment he is flying; it may be the arrogant attitude of those senior colleagues who build an image of operational prowess on disregard for established procedures, school methods, and self-discipline.

NONSTANDARD EMERGENCIES

What can you do about emergencies that are not covered in the book? This question in itself is part of the proper response to nonstandard emergencies in that it implies acceptance of the fact that not every form of airborne crisis can be pre-solved. Without this acceptance the pilot would not be mentally prepared to face the challenge of nonstandard trouble.

A Mohawk pilot on a night photographic mission experienced complete loss of control response, subsequent to a violent explosion somewhere behind him. His immediate reaction was to instruct the copilot to eject, followed by his own ejection. He landed a few seconds after the aircraft exploded on the ground, with the copilot still in it.

In analyzing this accident, the following factors must be considered:

1. The pilot had no way of knowing that the

explosion of a flare pod had severed the empennage from the fuselage.

2. The urgency of the situation and the noise level made it impossible for the pilot to realize that the intercom system, and all other electrical systems, had been disabled by the explosion.

The pilot's instinctive and proper reaction to abandon the aircraft was based on two clues: the explosion and loss of elevator control. The emergency in this case was part of the accident, since there was no transition period between the two and no alternative but ejection. The copilot's failure to save himself can be attributed only to his non-awareness of the pilot's order to eject and the pilot's ejection.

This accident, and another similar to it, led to definite improvements in the reliability of flare operations and the realization of the need for a foolproof ejection signal between crew members. In the meantime, the best preparation for emergencies of this type is familiarity with the experiences of somebody who lived through one.

Much of our most valuable experience is not shared, and therefore wasted, because we underestimate the teaching potential of unusual emergencies that leave crew and aircraft unscratched. A fine exception is the following incident that was reported in detail by a crew that understood its responsibilities toward fellow pilots.

A Mohawk cruising at 1,350 feet above the terrain at an IAS of 185 knots suddenly pitched up to about a 45° nose-high attitude. The pilot reduced power, rolled in full forward trim, and regained control of the aircraft with the assistance of the copilot. After an uneventful landing, it was discovered that the absence of one half-inch cotter pin in the left elevator trim tab push rod had resulted in loss of a bolt and disconnection of the left trim tab. With half of the effective nose-down trim suddenly gone, a violent pitchup was unavoidable. It was the crew members' opinion that, if one of them had not had his hand on the stick when the emergency occurred, ejection might have been unavoidable. Their instinctive realization that the circumstances warranted a delay of the push-button exit probably saved the aircraft.

Under the heading of nonstandard emergencies, we must also mention so-called false emergencies. Profitable efforts to assist the pilot in timely recognition of an emergency situation have resulted in the development of warning systems that, sometimes, cause more panic than confidence. We could probably equip another Air Assault Division with the cost of the aircraft lost by other services as a result of false fire warning lights. With the introduction of similar systems in our aircraft, it behooves us to understand their operation.

The pilot of a UH-1D, cruising at 1,700 feet above the terrain, did not waste any time going into autorotation when the low rpm warning system suddenly began to function (a red light on the panel and an urgent beep in the ear phones). When he noticed that engine rpm (N-2) had dropped to zero, he assumed engine failure and made preparations for a forced landing. Attempts to restart the engine appeared to be unsuccessful, judging by the lack of reaction of the N-2 needle. The forced landing resulted in substantial damage to the aircraft, but none of the six occupants were injured.

What happened in this case was that the engine (N-2) tach generator failed. This generator controls the indications of the N-2 needle and the triggering of the low rpm warning system. Failure of this lowly component has to result in a rapid drop to zero of the N-2 indication and activation of the warning system. It is disappointing, to say the least, that the other engine instruments (N-1, torque, EGT, etc.) went unnoticed by the crew. During the 50 seconds available between first warning and touchdown their attention was focused exclusively on the N-2 needle. Although the pilot's initial reaction was in accordance with the purpose of the warning system, it is interesting to speculate on what might have happened had he been familiar with its principle of operation. In all fairness we must add, however, that the pilot's handbook does not give this information. (Note: The UH-1D handbook is not the only derelict in this respect. One of our helicopter manuals states cheerfully that tail rotor failure is the most critical inflight emergency, followed by the revelation that "the first and most important step is to regain directional control." No hint as to how this can be accomplished except a noncommittal: "The pilot will determine the type of descent and landing.") Although a pilot lives "by the gauges" he should be enough of a skeptic to cross-reference any erratic instrument indication against corroborating evidence, if there is time. He should realize, for instance, that the engine rpm needle cannot wildly fluctuate or suddenly drop to zero without clear-cut side effects, unless the instrument is defective. The same applies to manifold pressure, torque meter, gas producer, and main rotor rpm.

Temperature instruments are no problem, because a pilot knows instinctively that working

temperatures don't fluctuate rapidly or drop to zero. Due to the simplicity of their design, their failure rate is low and failure will seldom be towards the "high" side. Probably more important than the actual reading of a temperature instrument is its trend, under otherwise normal conditions. An alert pilot, for instance, knows that he should expect a drop in cylinder head and oil temperature after levelling off from a climb. After the temperatures have stabilized, and after he has adjusted the mixture, he'll closely monitor the same instruments for any trend indicating too lean a mixture.

Although most engine failures have an unmistakable way of announcing themselves, one type may take the sightseeing pilot by surprise: engine failure resulting from lack of lubrication. Oil pressure and, in most cases, oil and cylinder head temperature readings will give ample warning to anybody who pays attention to them. The proper reaction to a true indication of impending engine trouble (this includes the chip detector warning light) is to get the aircraft on the ground, without undue haste, while power is still available.

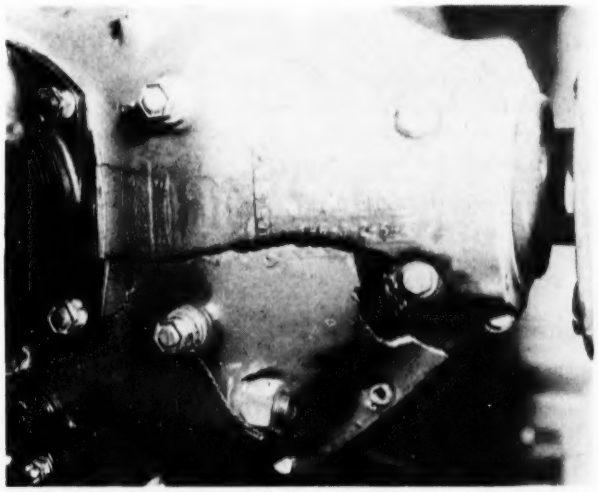
SELF-IMPOSED EMERGENCIES

So far, we have been discussing what may be called legitimate emergencies. The pilot plays no role in their origination and his main concern should be preparedness to tackle them. A third type of emergency forms a class all by itself. To avoid misunderstanding and to evoke the proper connotation, we will call this the self-imposed, rather than the illegitimate emergency. As the name implies, this type is brought about by the operator himself. No amount of emphasis on the pilot's gallant behavior *after* the self-inflicted emergency can camouflage this fact. Our files flow over with examples.

An aviator, advanced in age and rank, but relatively inexperienced, took off in an O-1 with an unsecured oil filler cap. After about one and one-half hours, he noticed that the throttle had to be advanced to maintain airspeed. Even when he had to firewall the throttle he was not aware of any unusual engine instrument indications. Finally, when his feet started getting hot he suspected trouble, but by that time the glowing engine resembled a nose cone upon re-entry and quit. The pilot was commended for the execution of a forced landing without damage. The engine was junked.

A sarcastic reviewer of this mishap might suggest that our pilots fly barefooted to make them more sensitive to laboring engines. The truth of the matter is that this aviator did not realize that engine instrument awareness is a basic means to forestall serious emergencies. And he is not the only one who got in trouble because he did not see the handwriting on the panel. Finesse in engine handling has become a neglected part of our training and is one of the reasons for the increasing number of premature engine overhauls. Engine abuse is often an accumulative process, and the man who finally ends up with the emergency may be one of the few who are never guilty of malpractices such as: tardiness in reducing takeoff power, especially rpm; overrevving; crude mixture leaning methods; and imprudent use of carburetor heat.

A favorite way to blunder into an emergency is poor fuel management and cruise control. What follows is one of the many variations on this theme.



Self-imposed emergency, cracked crankcase

A U-9, on a pre-Christmas administrative flight, ran out of fuel on a night IFR flight and was force-landed at a cost of $158,000. Nobody was hurt. The local investigation board attributed the accident to iced-over fuel vent lines, resulting in collapse of the fuel cells and siphoning of fuel past the filler caps.

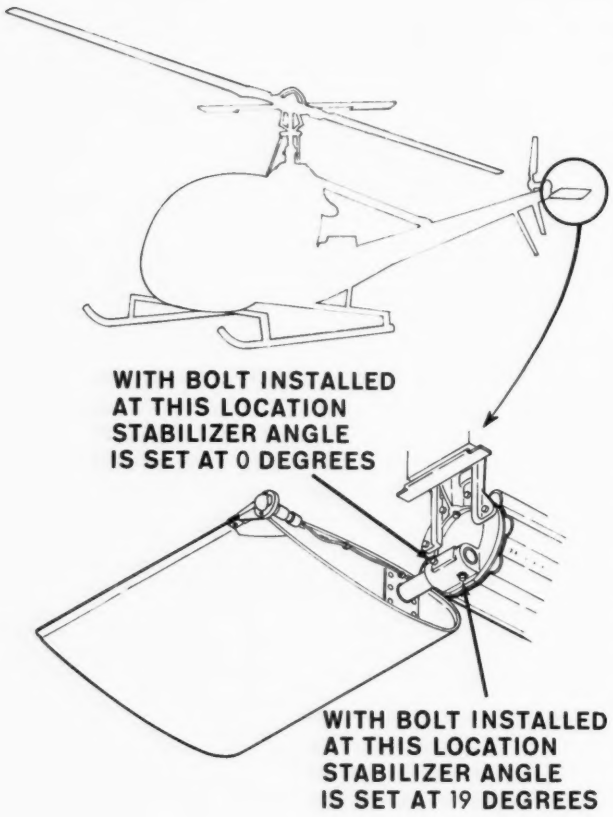
Review of the pilot's statement showed that the power settings he reported would have resulted in an endurance of about 3 hours and 45 minutes. Actually, the aircraft ran out of fuel after 3 hours and 32 minutes.

Belatedly it was discovered that this aircraft did have electrically heated vent lines and that the fuel cells did not collapse. It was also discovered that this crew, and many others, did not

realize that the fuel consumption in this aircraft will vary between about 24 and 96 gallons per hour, depending on power settings, altitude, temperature, etc.

Some of our deadliest self-imposed emergencies are the end result of years of substandard behavior and slipshod methods. We have lost scores of airplanes and colleagues in weather accidents for the unforgiveable reason that they failed to develop or maintain instrument flying skill. Others, guided by a cocky "no sweat" motive, invite emergencies by concessions regarding the mechanical condition of the aircraft and failure to recognize their own and the aircraft's limitations.

In addition to the self-imposed emergency, there is a built-in type. We are referring here to design idiosyncrasies in the cockpit that induce trouble. Examples: fuel selector valves that have to be turned to the left to get the right tank and vice versa (who said these stupidities ended with WW II?); a stick grip trigger that controls the transmitter in one aircraft and the guns in another; a cargo sling release master switch, identical in appearance and located as close as possible to the emergency fuel shut-off switch; nonstandardization in the layout sequence of throttle, propeller and mixture levers; and so on. Although human engineering considerations, reportedly, play a role in the design of our cockpits, there is no guarantee against the presence of traps. Awareness of these not-so-tender traps should be part of the pilot's routine aircraft knowledge.



Finally, we have to consider the fallability of our best friend: the maintenance man. Although we think we flatter him when we take the quality of his work for granted, we may be doing him a disservice. A thorough preflight by the pilot shows the mechanic that he has to do with a knowledgeable man whose "Ship's in fine shape" is based on appreciation of good workmanship. Crawling into the cockpit after a well-aimed kick in the tires is an insult to responsible maintenance personnel and deprives them of two important morale factors: pride and motivation. In addition, we may invite trouble.

The OH-23C has two positions for the horizontal stabilizer. The drawings show the stabilizer at its negative angle of incidence to offset the nose-down tendency when litters are installed. An unnecessary accident occurred when the aircraft was flown after the litters had been removed, but without changing the stabilizer position: the pilot ran out of forward cyclic. A typical example of a self-imposed emergency, involving the pilot as well as maintenance personnel.

A recent case of a U-6 that became unglued during takeoff because the ailerons were rigged in reverse needs no comment. It should be obvious by now that the best way to handle self-imposed emergencies is to avoid them.

SUMMARY

The purpose of this morbid discussion, speckled with the sad experiences of some of our colleagues, was to encourage the individual pilot to take a close look at his own preparedness for emergencies. Assuming that this has been accomplished, we can afford to close with an optimistic thought.

There is no need to spoil the enjoyment of flying by constantly worrying about what may happen and what to do when it happens. The right-minded pilot knows the answers before he ever leaves the ground; he keeps this knowledge up-to-date and in dry storage, ready to be used when the need arises, without making an obsession of it. As it was said long ago, the best form of optimism is to hope for the best but prepare for the worst.

free insurance

Your Weather Service

Lieutenant Colonel C. M. Terry

IT WAS A ROUTINE VFR round-robin flight. Everything had gone according to schedule. Turbulence had bounced the old bird around considerably during the landing at a remote strip. But supplies were off-loaded so it would be lighter for the takeoff, and the Beaver was operating perfectly.

The engine checked out OK during the runup and the takeoff seemed normal enough—until the wheels left the ground. Then it was apparent that something was wrong. It wasn't gaining altitude, even with full power, and it was rapidly approaching a hill dead ahead. As a last resort, the pilot attempted a low-level turn to avoid the hill. But the low wing hit a tree and the aircraft crashed.

This accident happened last summer and the investigation board concluded that the probable cause was severe turbulence and a strong downdraft. Since a weather factor was involved, a thorough investigation was made to determine just what weather information the crew received before and during the flight. This investigation proved very revealing. First, it was discovered that no request was ever made for a weather forecast for the strip area. In fact, the DD Form 175 did not even indicate the strip as a point of intended landing.

Second, the 175 was not

Col Terry is Staff Weather Officer, U. S. Army Aviation Center.

signed by a forecaster and no record could be found to indicate the pilot ever received a weather briefing, either in person or by telephone. Unfortunately, we'll never know why this pilot didn't get a weather briefing. He was also careless about wearing shoulder harness. As a result, he was thrown from the aircraft during the crash and killed.

Air Weather Service, commenting on this accident, said: "We recognize that even if forecast service had been requested, it would not have guaranteed that severe turbulence or downdrafts would have been forecast. Even if they were, the flight might have been conducted in the same manner. We are concerned in that weather service was available and not used."

Though proper use of weather service might not have prevented this accident, failure to make full use of available weather services can be a very serious matter. Consider the case of a CH-21 that crashed a couple of years ago. It, too, was on a routine flight, assisting in a search for a missing civilian aircraft.

The flight departed at 1245 EDT and made a passenger-refueling stop at another airfield 75 miles away to pick up two Civil Air Patrol members, who were to act as scanners during the search. After participating in the search for 3 hours, the pilot landed, off-loaded the CAP members, refueled, and took off for home. The aircraft crashed at 1825 EDT in weather described by the copilot as, ". . . almost zero-zero, in fog and drizzle." The pilot was killed and the copilot and crewchief sustained minor injuries.

Investigation revealed that poor use was made of available weather facilities and services. The 6-hour flight was filed VFR on a DD Form 1080, Local Flight Clearance. Since forecast service was not available at the departure airfield, the pilot accomplished a self-briefing by checking the data from the FAA teletype circuit. He made no attempt to get a weather briefing from a qualified forecaster by telephone, and he made no inquiries about weather for the remainder of the flight, except to listen to a couple of weather broadcasts on the VOR.

Several actions on the part of the pilot might have prevented this accident:

1. A collect call to the nearest Air Weather Service Briefing Advisory and Warning Service station (in this case, located in the same state) would have alerted him to expect below VFR conditions by the end of the 6-hour flight. Some nearby mountain stations were reporting IFR weather well before he took off, and deteriorating weather was forecast.

2. A check of en route and destination weather during the last passenger and refueling stop would have informed him that the reporting station nearest his destination was already IFR, with an indefinite ceiling of 200 feet and visibility ¼ mile in fog. And a lowering trend was indicated.

3. Observations and forecasts available through inflight facilities could have warned him of the dangerous weather conditions. It almost appears that this pilot avoided finding out about the weather for fear it *would* prove to be IFR!

4. A quick 180 when he encountered IFR conditions would have made it possible for him to reach an alternate airfield, since several in the vicinity were still reporting VFR at that time.

It's clearly evident that the lack of proper respect for adverse weather, and failure to make use of available weather services cost this aviator his life.

Before you rationalize this problem away by thinking, "Isolated case—doesn't mean anything," or, "That couldn't happen to me," etc., you should think about a recent study conducted by USABAAR. They found that 38 accidents, *and* 33 fatalities happened in IFR weather during a 4-year period. It is a significant fact that 37 of those 38 accidents involved

flights with VFR flight plans. If they don't accomplish anything else, these statistics should prove that it is unwise to attempt VFR flights in marginal weather conditions. And it should be evident that carelessness, overconfidence, and poor weather are a lethal combination.

A weather briefing on existing and forecast weather is an essential part of any properly planned flight. It's true that a pilot can learn a great deal about a proposed flight by looking at teletype data and forecasts. This practice is recommended as an excellent way to prepare to receive a briefing. But it should never take the place of a briefing.

There are several good reasons why the weather briefing is essential. First, AR 95-1 states that all pilots, prior to takeoff on any flight, will obtain the most recent weather information available and that a forecaster, if available, will be the source of this information.

When you sign a local flight clearance, you certify that the weather is *forecast* to remain VFR for the duration of your flight. Can you be sure of this without consulting a forecaster?

If you check the weather yourself, there's a chance you may overlook something important, regardless of how thorough a job you think you've done. The worst weather conditions rarely occur over reporting stations and sequence reading does not

always provide a representative picture. The forecaster is trained to assimilate and interpret the vast amount of available information in such a way that he can give you a weather picture that is as accurate and complete as possible.

Another thing to consider is that changes in existing and forecast weather can occur rapidly on occasion. If the forecaster has briefed you and knows your flight is in progress, he may be able to issue a "met" watch advisory which would alert you about a potentially dangerous situation.

To ensure that briefing service is readily available at all locations in the United States, Air Weather Service recently increased the number of Weather Briefing Advisory and Warning Service (WBAWS) stations from 7 to 26. The locations and telephone numbers for these WBAWS are shown in Jeppesen manuals and Flight Information Publications (FLIP). A collect call to the nearest WBAWS will make it possible for you to get a detailed weather briefing. The service is free. All it costs is a few minutes of your time.

The weather briefing, essential though it is, should not be considered the final word. Changes can and do occur. Occasional forecast "busts" are inevitable. The pilot who recognizes that there are limitations keeps himself abreast of changes through the use of excellent inflight facilities provided for this purpose. Among these services are Flight Following Service, continuous weather broadcasts, Pilot to Forecaster (or Weather Briefer) Service, storm detection radar information, and flight advisories regarding hazardous weather conditions. Proper use of these services can ensure the safest possible flight.

Our government spends millions of dollars each year to provide weather services so that aircraft operations may be conducted with maximum safety. Many weather factor accidents could be prevented if these services were used properly. You can do your part by:

1. Becoming thoroughly familiar with available facilities and services.
2. Learning to use these services to maximum advantage. Habits formed by practice during good weather will ensure that you get weather information when you really need it.
3. Taking it upon yourself to keep informed of the latest weather throughout each flight.
4. Supplementing and improving weather services by providing timely and accurate inflight and/or postflight reports of unusual or unexpected weather that you encounter.
5. Flying the weather as it really is—not as you hope it will be. If it's IFR, file IFR. If you can't file IFR, don't go.
6. Recognizing your limitations and the limitations of your aircraft with regard to weather.

Bell Weapons Support Helicopter Demonstrated

A DEMONSTRATOR model of a new armed helicopter, the Sioux Scout, was shown recently at the U. S. Army Artillery and Missile Center, Fort Sill, Okla.

The Sioux Scout was described by Bell Helicopter Company officials as a flying mockup of an escort helicopter. The Scout, derived from the OH-13 series, was developed for refining ideas on what the Army needs in a weapons support helicopter.

The two-place Scout features tandem seating, with the gunner in front of the pilot. This arrangement gives the gunner maximum vision, enabling him to exploit the flexibility and accuracy of two M-60 machineguns mounted beneath the nose of the chopper. The guns, capable of delivering almost 1,000 rounds of fire per minute, are electronically synchronized with the pilot's visual sights.

Short wings behind the pilot contain the fuel tanks. A turbosupercharged powerplant gives the Scout more lift, more speed (up to 91 knots), a better climb rate, and more maneuverability than earlier models.—*News Release.*

SHARE IT

. . . Near Accident and Flight Hazard Reports

LAUNCHED 10 June 1963, the Share It Army Near-Accident and Flight Hazard Reporting System is designed to gather and exchange information about aviation hazards. The response has been both encouraging and informative.

Accident prevention information based on accidents of the type usually described in CRASH SENSE is both after-the-fact and expensive. Prevention information based on Share It accounts has a triple advantage: it is before-the-fact, it is dirt cheap, and it often gives us the positive action that was used to prevent a near accident or flight hazard having to be reported by crash facts message or accident report. For these reasons, we're happy to present extracts from the first batch of Share It forms received by USABAAR.

crash sense

PREPARED BY THE U. S. ARMY BOARD FOR AVIATION ACCIDENT RESEARCH

"As I started to turn off the active at a naval air station after completing a GCA, I heard the roar of a PV-2 naval reconnaissance plane pass overhead at a very low altitude. The PV-2 was attempting a go-around, but it was mushing in. The gear was down and power applied, but a combination of low airspeed and high density altitude were working against it. The gear came up, but the mush continued. Then the gear came back down and it looked like it wasn't going to fly. Just before touching down, the pilot got it flying again and made his go-around.

"Later I talked to the PV-2 pilot and found that he had also been on a GCA and hadn't seen my U-6 on the active. Nor had he been informed by the controller until he was committed to the landing. He said that if it had not been for the fluorescent paint, he would not have seen me until too late. We learned through operations that the controller said there were four miles between aircraft when the PV-2 turned on final.

"The lesson to be learned here is to be sure, when going into Navy or Air Force bases used by high performance aircraft, that GCA controllers are aware of low approach speeds."

"A signal repairman neglected to replace the cover on the circuit breaker box behind the copilot's seat. We didn't notice it during preflight, since it was hidden from view behind the seat, which had a chest type parachute harness in it.

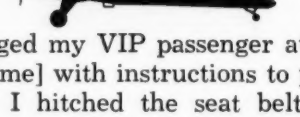
"During takeoff, metal snaps on the strap of the chest type harness, which were hanging over the rear of the seat, came into contact with electrical circuits in the open circuit breaker box. Violent flashes of fire and smoke shot from behind the copilot's seat. The copilot took control and I tried to remove the snap links, getting several more electric flashes before I pulled them loose. Much confusion!"

"My passenger climbed in and placed his attache case to the rear of the cyclic stick. I failed to check for free control movement, and as I brought

the helicopter to a hover, I found that I had no rearward play in the cyclic and could only fly forward. There were obstructions straight ahead so I couldn't take off. Somehow, I managed to land without incident."

"I discharged my VIP passenger at an airstrip and he left [me] with instructions to pick him up in an hour. I hitched the seat belt across the empty chute in the copilot's seat and left for a nearby airbase for service and fuel. As I dumped landing flaps on final, the angle change toppled the chute over the belt. I pulled it back into position so it wouldn't hamper the yoke during the landing. I goosed the throttle for reassurance and found it dead. Fortunately, I had enough altitude to make a dead stick landing on the runway.

"Apparently, when the chute toppled, the shoulder strap hooked into the emergency fuel shut off and when I pulled it back into position, the engine developed a bad case of fuel starvation."



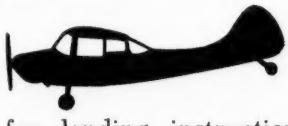
"Shortly after breaking ground on runway 28, I had a near miss with a large radio controlled model airplane which appeared to be controlled by some people about 500-1,000 feet west of the runway. I had to quickly alter my flight path to avoid collision.

"I do not consider the end of an active runway to be suitable for flying radio controlled model airplanes."

"We were on a training flight and had been working at a stagefield near the main airfield. We had just broken traffic with a westerly heading and I busied myself inside the cockpit, helping the crewchief record instrument readings.

"This was my student pilot's first flight in the Chinook. He had spotted a U-6 to our right front which was also heading west. He then focused his attention inside the cockpit to adjust his compass heading indicator.

"When I looked up, we were on a head-on collision course with this same U-6, which had just completed a 180° turn to the left. I grabbed the cyclic and made an immediate right turn. We passed within 300 feet of the other aircraft. The U-6 showed no indication of its pilot having seen us. I feel weather was a contributing factor. Surface visibility was 5 miles in haze and the sun was still low on the horizon."



"I called for landing instructions and was cleared to enter right downwind, runway 25. As I came in on my entry leg, I saw a small civil aircraft making slow turns about 500 feet above my altitude, directly over the center of the airfield.

"After I rolled out on downwind, I glanced off to my right. At this time, the tower called me and told me to break left at once. At the same time I noticed the small aircraft had started slow descending turns and was now at my level. He was coming directly toward me on a collision course. We missed by about 25 yards, I think."

"I took off from runway 28 and had to bank hard right to avoid collision with a model airplane that was being flown at an altitude of approximately 200 feet and about 1,000 feet off the end of the runway."

"We were making a landing in a considerable crosswind and were alert to the possible need for brakes to assist directional control in the landing roll.

"During the landing roll, brakes were applied and the brakes locked, causing the plane to skid to an uncontrolled stop on the runway. My first thought was that the pilot had become apprehensive of the crosswind problem and had misused the brakes, but he immediately called my attention to the parking brake handle which was in the 'out' position. It is not known how or when

the handle was pulled out; however, in reviewing our knowledge of the brake system, the following was noted:

"Page 1-18 of TM 1L-20A-1, dated 5 Jan 60, states in part that 'momentarily depressing the toe pedals releases the parking brake to the OFF position.'

"This fact, while true on older U-6As, does not apply after compliance with TM 1L 2OA-511 and, further, TM -511 makes no mention of the change in operating characteristics.

"Also, the parking brake handle design is such that it may catch on clothing. If pulled out, it will not spring back to the OFF position as it did before modification.

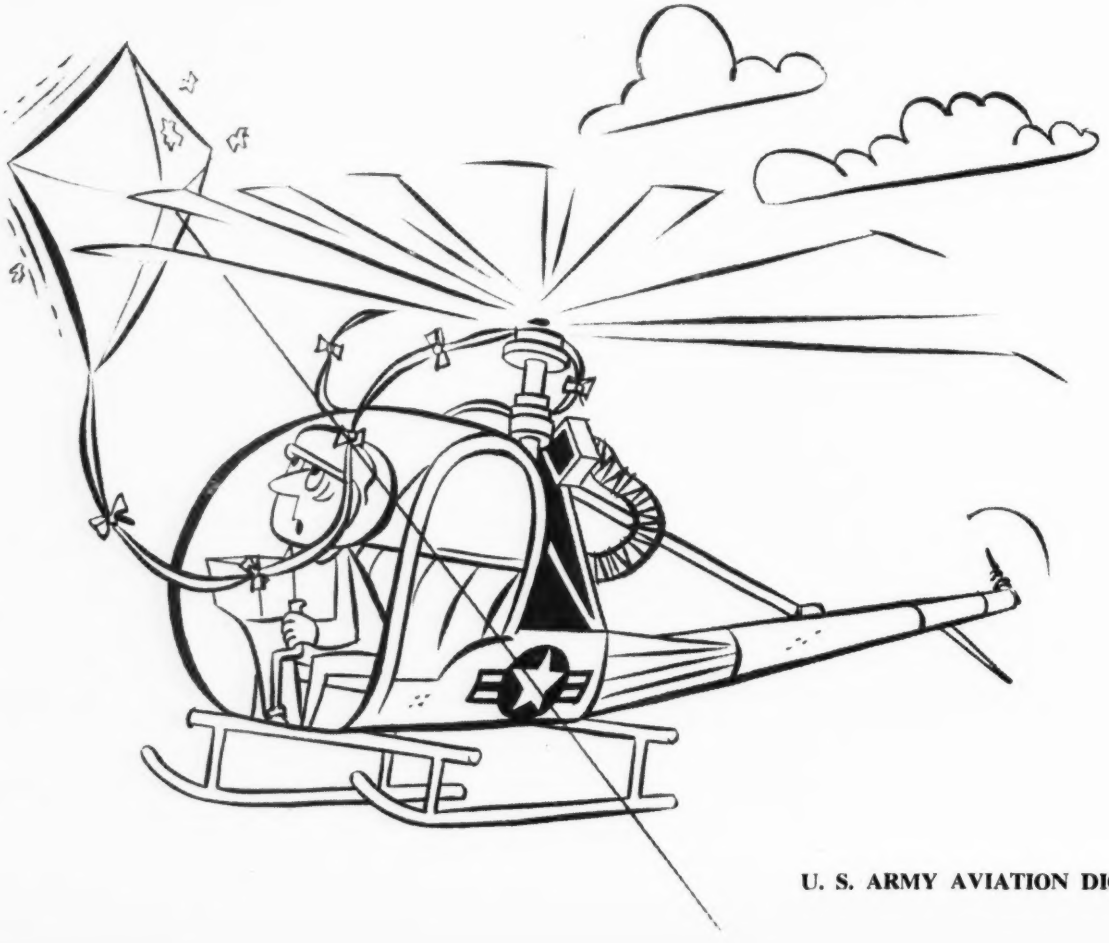
"The pilot graduated from Aviation School in April 1961, qualified in U-6A and is a TC school qualified maintenance officer. Both he and I had never encountered this difficulty before and both had the feeling that if the parking brake handle were inadvertently pulled out prior to brake application, it would not lock but would spring back to the OFF position and that the only way to set the parking brakes is as stated in the TM, to pull out the brake handle *while* the toe brakes are depressed.

"The two U-6As assigned were checked and it was found that the parking brake handle can be pulled even while taxiing, and the next time brakes are applied will remain on and can only be released by pushing in on the handle."

"The main rotor struck a kite string and pulled the kite through the main rotor blades. Luckily, the kite was made of crepe paper and caused no damage."

"I filed IFR and entered the clouds at approximately 1,000 feet. I remained in the clouds to 11,000 feet. Suddenly the left engine failed. I was on autopilot and the aircraft started a roll to the left.

"I immediately disengaged the autopilot and leveled the aircraft. I then went through the normal single engine procedures and manually



feathered the No. 1 propeller. At the same time, I called the controller, told him I had lost an engine, and wanted to declare an emergency. I then turned the IFF to the emergency position and the controller told me that reception was good.

"I told the controller I wanted a vector to another airfield because I knew it was the best in the area. I tuned the VOR and ADF to the navaids at that airfield.

"My airspeed dropped from 160 knots to 110 knots, and I lost approximately 100 feet. I requested an immediate descent to try and break out of the clouds. I was cleared for the descent and told to report when VFR.

"I finally broke out of the clouds approximately 1,500 feet above the ground. During the descent, I maintained 150 knots IAS. When I broke out of the clouds I was about five miles from the airfield. I maintained 110 knots on final and completed my landing without further incident."

"We approached our destination on an IFR flight and were handed over from the en route controller to approach control. The weather was clear with 10-15 miles visibility.

"Approach control put us on a modified entry to the GCA traffic pattern within 10 miles of the field. At this time, approach control notified us we had a target at 12 o'clock, one mile away. The target actually approached us from the left rear, and when we finally saw him—late because of his direction of approach—we recognized a large B-57 making a violent evasive maneuver at or near our altitude. This B-57 was also being worked by the same RAPCON. At the time our controller called to tell us it was at 12 o'clock and a mile away, the B-57 was actually maneuvering to avoid us. Apparently the approach controllers were not on speaking terms!"

"A number of our CH-34s have soft nylon safety belts installed. This belt slips loose in five minutes, or less, and has to be continually retightened. This could result in serious injury in the event of an accident, and it could be responsible for loss of control in turbulence. The safety belt number is lap-type MD-2, P/N 54H19651.

"I recommend these belts be eliminated and replaced by stiffer nylon and/or cotton belts."

And Here Are Some Flight Hazards That Ended In A Major Accident...

WEIGHT AND BALANCE

THE ACCIDENT

On an approximate heading of 340°, the UH-1A raised to a hover from a taxiway. The pilot hovered sideways to the left on the same heading. When he reached the sod area between the main runway and the taxiway, he turned to an approximate heading of 70°, then discovered he could not stop his forward movement.

He attempted to set the helicopter down on a slight upward incline ahead of him. The aircraft rocked back and he corrected rapidly, trying to

hover to the level taxiway. It continued to move forward in a nose-low attitude, while rotating clockwise. The pilot looked ahead and realized he had to get it on the ground to keep from running into some parked helicopters and fuel drums.

He attempted to autorotate and inadvertently reduced his collective pitch. The helicopter struck the taxiway hard in a nose-low attitude, shattering the chin bubbles, breaking the left skid, and bending the right skid into the fuselage. As it slid around on the taxiway and came to rest, one main rotor blade, the tail boom, and the tail rotor blades struck the ground. Fortunately, there were no injuries. But major damage to the fuselage, tail boom, tail rotor blades, elevator, engine mounts, and fuel cells totaled more than $36,000.

THE INVESTIGATION

A check of flight controls and links showed all systems intact and working. The tail rotor drive shaft was twisted off 4 inches forward of the aft end of No. 1 shaft. The spline coupling in the No. 1 hangar was torn loose. The engine was running normally at impact.

Internal cargo consisted of six empty auxiliary fuel containers, several duffel bags, metal parts for the auxiliary fuel containers, assorted field gear, and two empty wooden ammunition boxes. Total weight in the cargo compartment was approximately 1,790 pounds. The pilot and crewchief were aboard and the aircraft was filled with fuel prior to takeoff to a full weight of approximately 1,007 pounds.

THE ANALYSIS

Total weight for the aircraft was computed at approximately 7,258 pounds, making it approximately 58 pounds overgross at takeoff. The center of gravity was found to be at station 123, five inches forward of the permissible limit for the gross weight. This was caused by the six auxiliary fuel containers being placed in a position that put their center of gravity at station 94.

At the time of the accident, the pilot had accumulated a total of 35.5 hours UH-1 time, and he had not completed transition training, or ground school requirements for a 3-hour block of instruction concerning UH-1 weight and balance.

THE CAUSE FACTORS

1. Inspection — The aircraft was hurriedly loaded so it could take off in time to join formation. No inspection was made to determine if gross weight or center of gravity limits had been exceeded.

2. Operation — The pilot failed to recognize the out of balance condition, although nearly full aft cyclic was required to keep the aircraft level at a hover after liftoff.

3. Training — The pilot had not received unit ground school training for computing center of gravity in utility helicopters. Only limited training had been given him for internal loads consisting of personnel.

4. Supervision — The pilot was assigned to a cargo mission requiring a knowledge of loading techniques which he had not been taught.

A Chance To Get In The Act

SO YOU DON'T like the Army Aviation training literature publications, or you think the ones we have should be organized in some other way? Well, say so.

You can, you know.

The U. S. Army Aviation School will evaluate your personal suggestions. If you think we need a new field manual, a new technical manual, or any other of the several types of DA publications, you can write the School instead of just complaining to anyone who happens to be around.

Recognize, however, that suggestions concerning publications gain in validity if they have been previously staffed in your own unit or at least among several people who are vitally concerned in the area involved.

In January of each year the U. S. Army Aviation School formalizes the Army Aviation Training Literature Program for the next two years. Proposals, whether changes or completely new manuals, are submitted to USCONARC for initial approval and then by that headquarters to the Assistant Chief of Staff for Force Development, DA. While awaiting formal approval, the School begins research and development of the proposed changes, revisions, or new publications.

One thing to remember before submitting your suggestions is that the Army Aviation School is not responsible for all publications dealing with Army Aviation. For example, TMs on specific items of equipment, such as aircraft operators' manuals, are not prepared by the School. Recommendations concerning these should be submitted to the originating agency shown in the first chapter of the publications.

With these cautions in mind, go ahead. Address your suggestions to the Commandant, U. S. Army Aviation School, ATTN: AASPI, Fort Rucker, Ala.,36362.

P.S. For more information on the types of Army publications and how they are prepared, see AR 310-1 and 310-3.

Annual Index Available

The U. S. ARMY AVIATION DIGEST 1963 Index is available by request. Address: Editor, U. S. ARMY AVIATION DIGEST, U. S. Army Aviation School, Fort Rucker, Ala.

AA Training Established at Olathe NAS

ARRANGEMENTS have been completed for the joint Army-Navy use of Olathe Naval Air Station, Olathe, Kans., as an additional Army Aviation training facility, the Department of Defense recently announced.

The additional facility is necessary to accommodate increased Army requirements for aviation. The use of a portion of the air station facilities will make it possible for the Army to meet these requirements without opening a new installation.

The Army plans to conduct fixed wing primary and instrument flight training at Olathe. Flight instruction will be conducted in Army aircraft maintained by a contractor.

Current plans call for this additional flight training school to be operational in time to accept the first class of students by mid-1964. Subsequent classes will be phased in on a periodic basis, until peak officer and enlisted student loads are reached.

Fort Rucker, Alabama, which will continue to operate at full capacity, will be used primarily for advanced training.